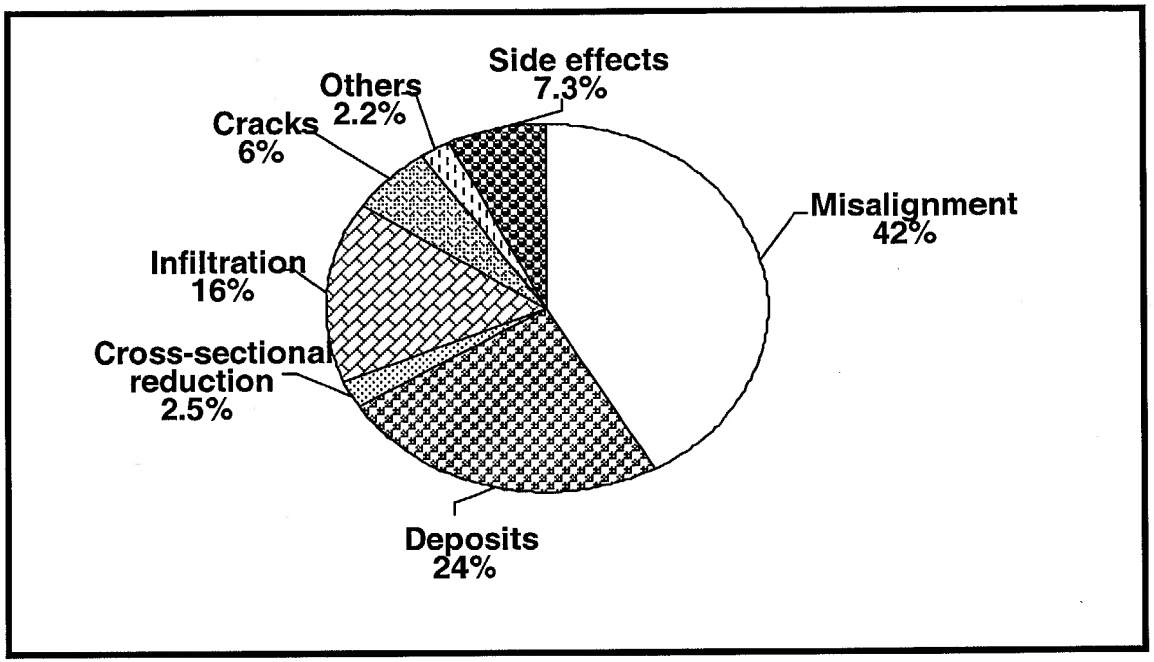

Side effects
7.3%
Others
2.2%
Cracks
6%
Misalignment
42%
Infiltration
16%
Cross-sectional
reduction
2.5%
Deposits
24%

FIGURE 1

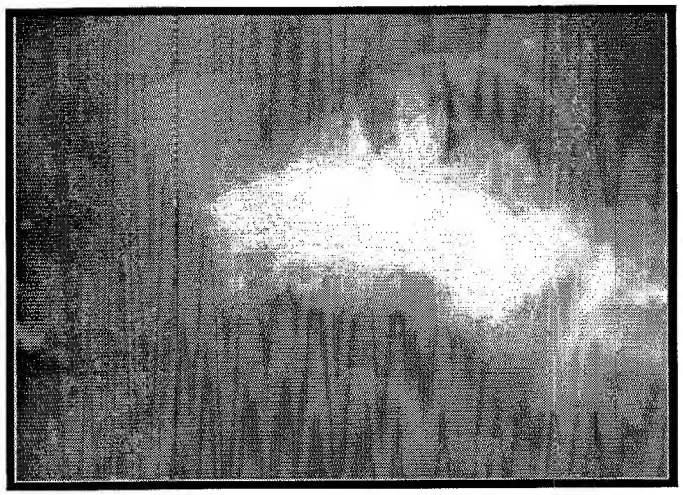


FIGURE 2

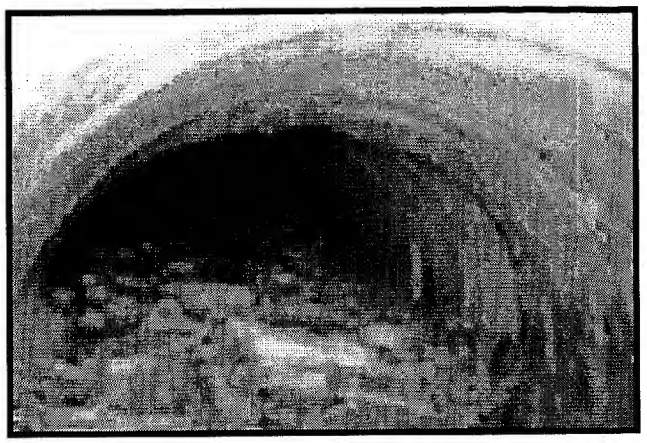


FIGURE 3

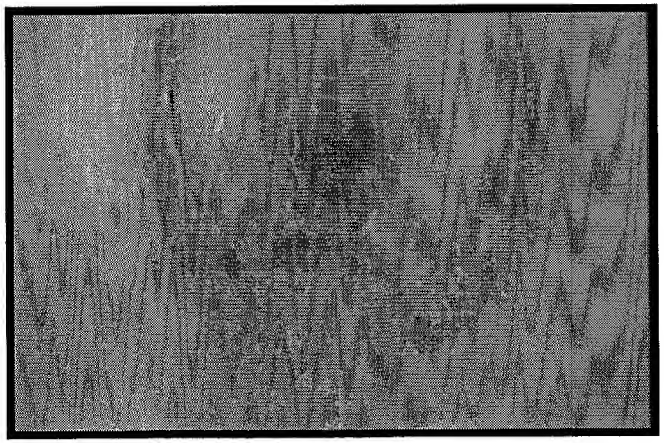


FIGURE 4

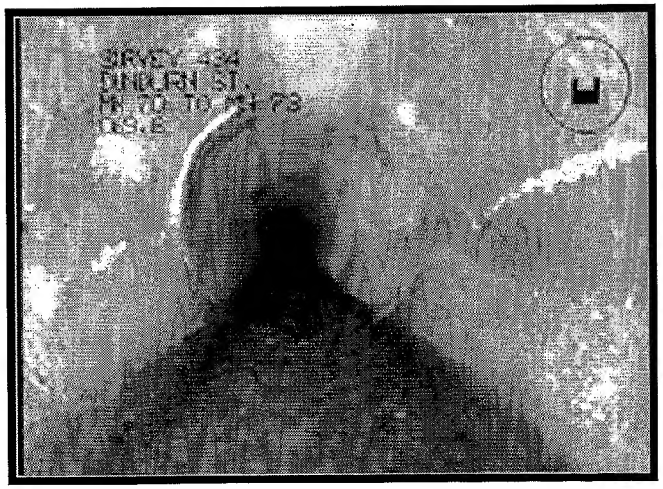


FIGURE 5

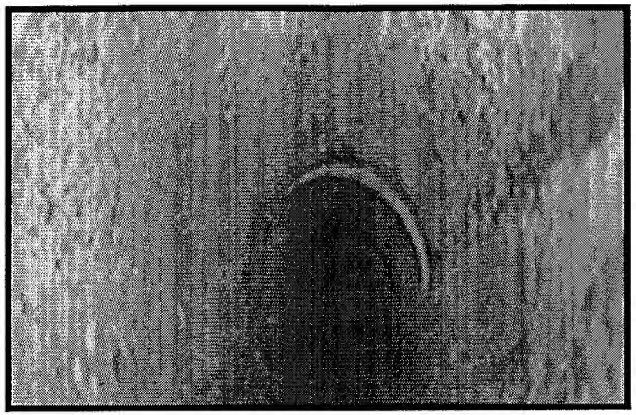


FIGURE 6

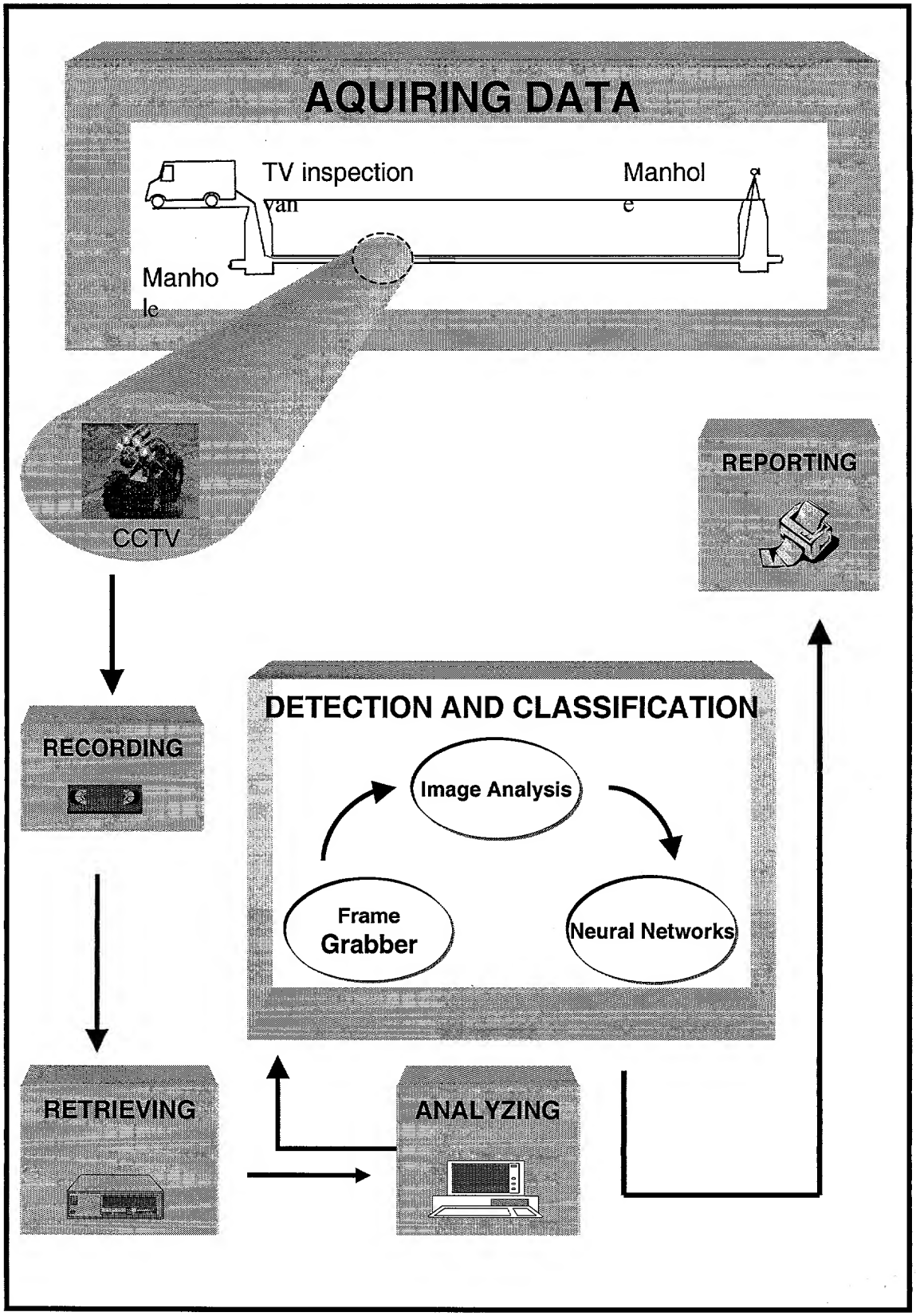

AQUIRING DATA
TV inspection van
Manhole
Manhole
CCTV
REPORTING
RECORDING
DETECTION AND CLASSIFICATION
Image Analysis
Frame Grabber
Neural Networks
RETRIEVING
ANALYZING

FIGURE 7

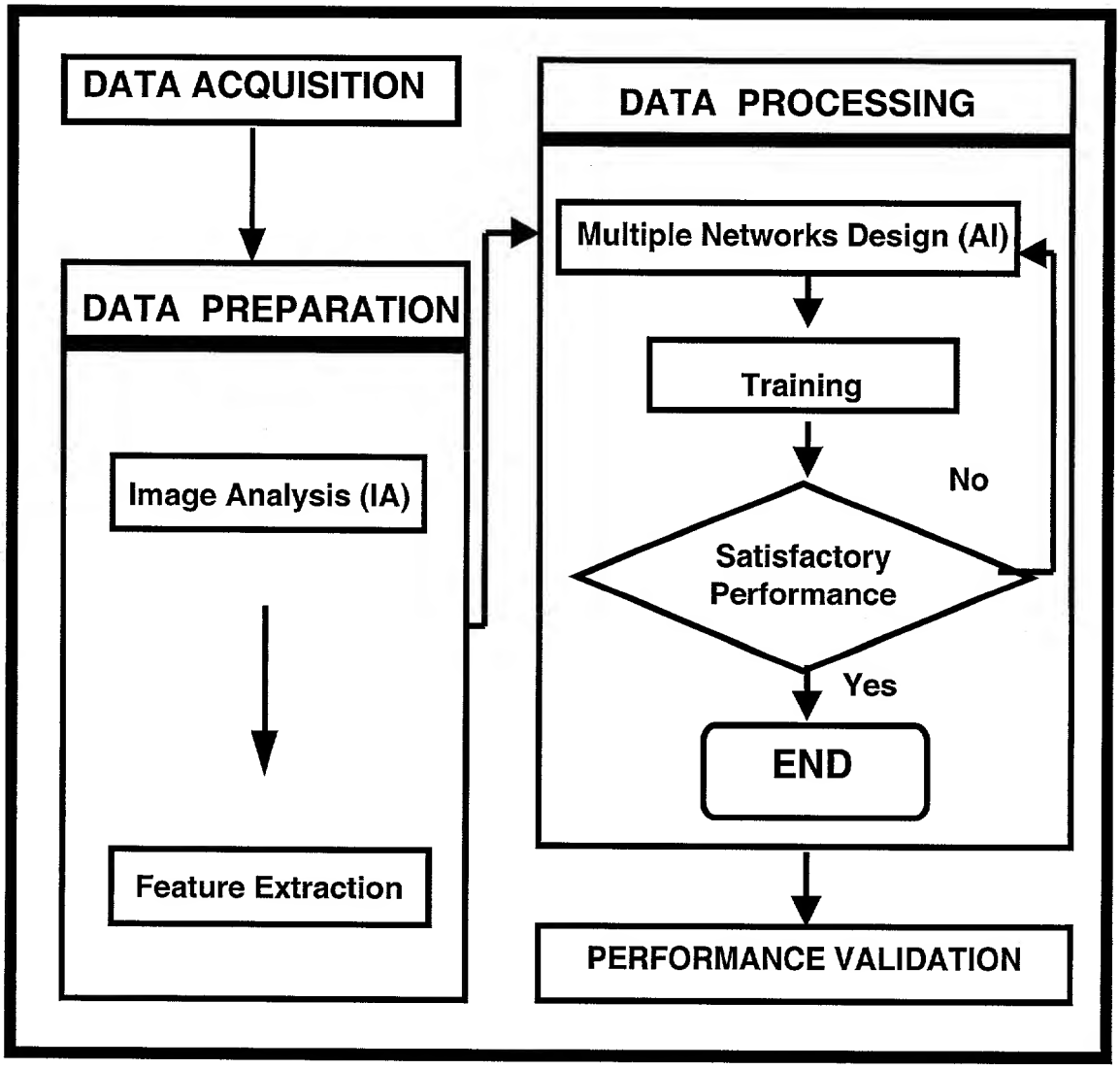

DATA ACQUISITION
DATA PREPARATION
Image Analysis (IA)
Feature Extraction
DATA PROCESSING
Multiple Networks Design (AI)
Training
No
Satisfactory Performance
Yes
END
PERFORMANCE VALIDATION

FIGURE 8

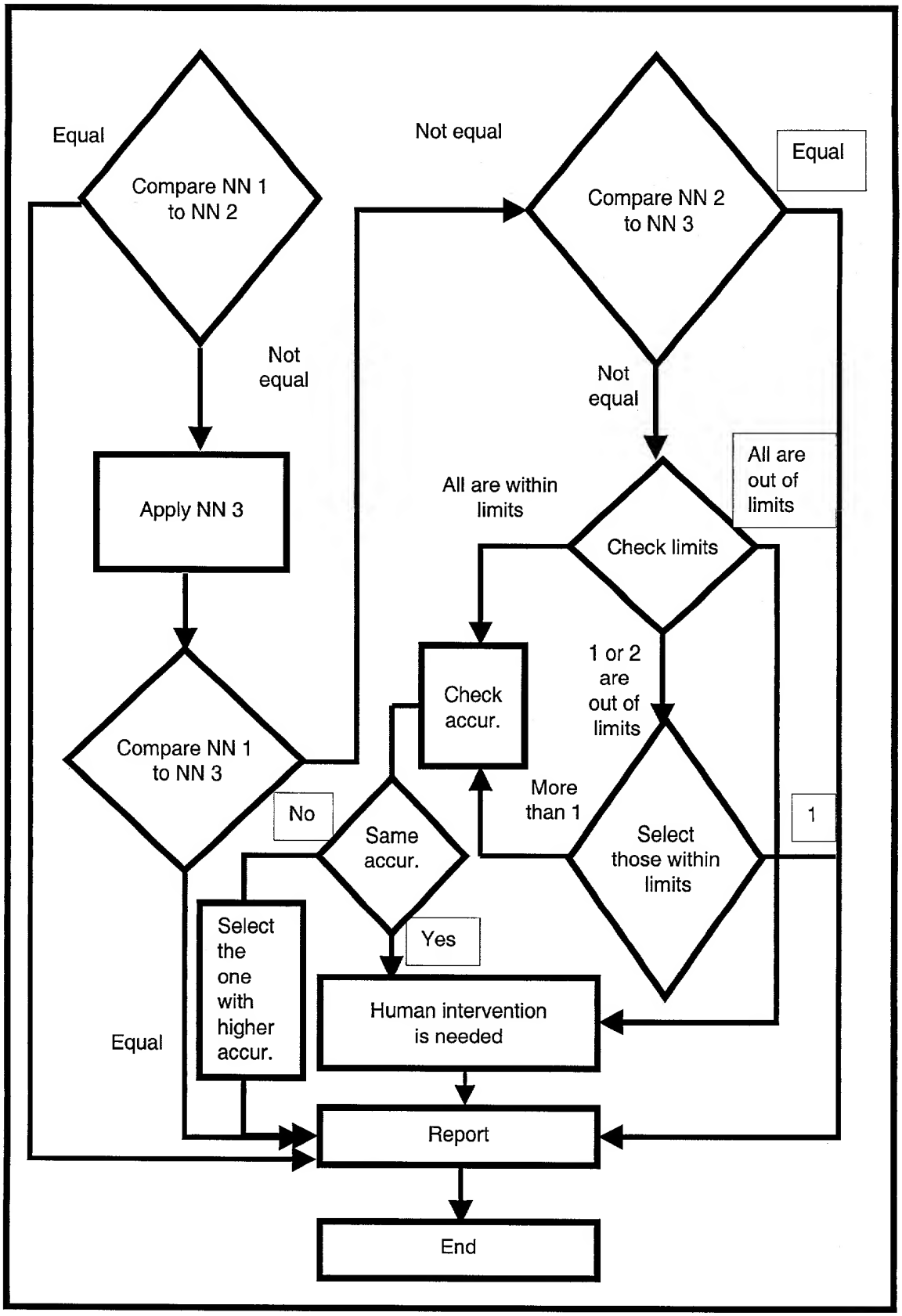

Compare NN 1 to NN 2
Equal
Not equal
Compare NN 2 to NN 3
Equal
Not equal
Not equal
Apply NN 3
All are within limits
All are out of limits
Check limits
Check accur.
1 or 2 are out of limits
Compare NN 1 to NN 3
No
Same accur.
More than 1
Select those within limits
1
Select the one with higher accur.
Yes
Equal
Human intervention is needed
Report
End

FIGURE 9

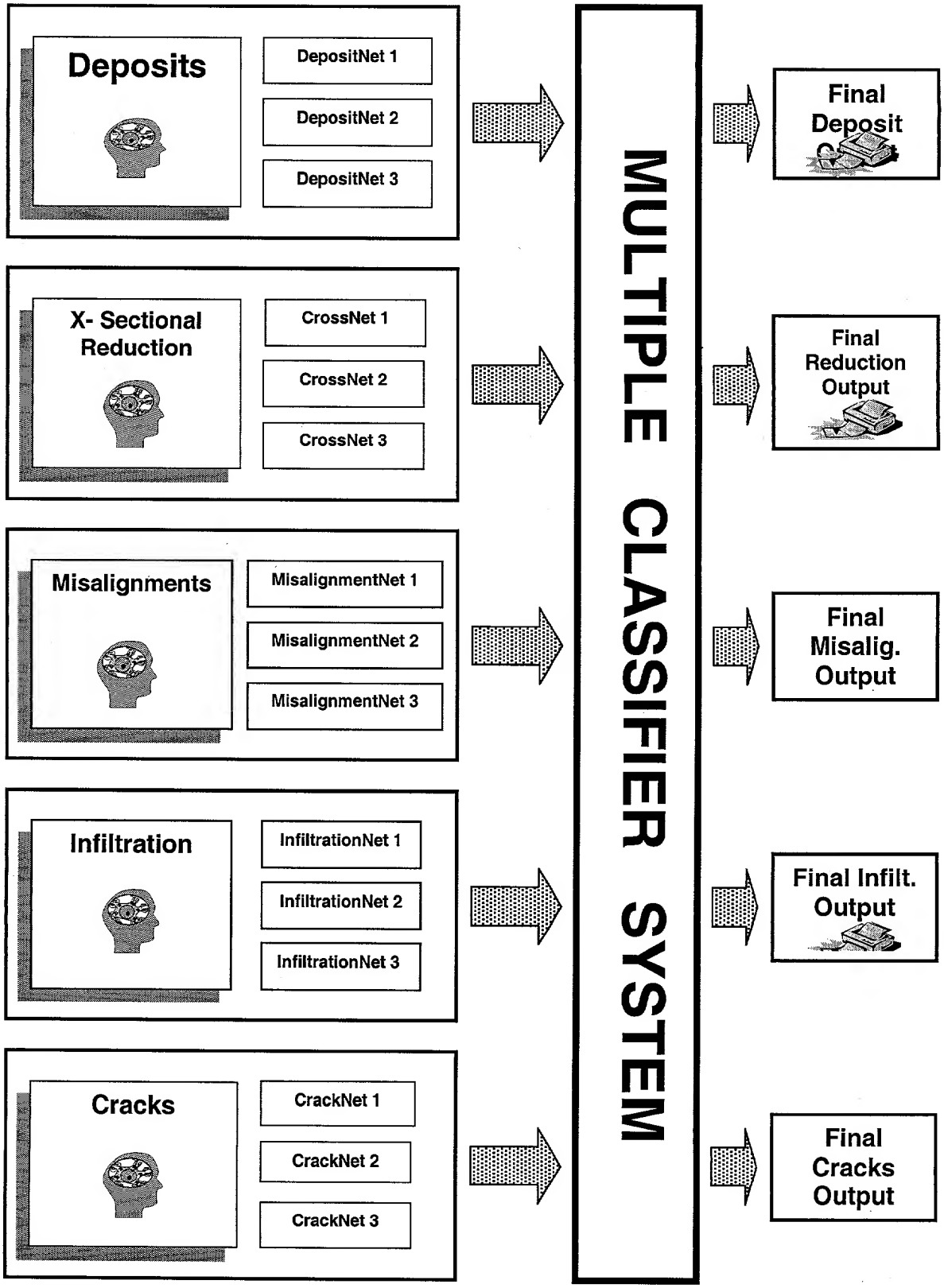

Deposits
DepositNet 1
DepositNet 2
DepositNet 3
X- Sectional Reduction
CrossNet 1
CrossNet 2
CrossNet 3
Misalignments
MisalignmentNet 1
MisalignmentNet 2
MisalignmentNet 3
Infiltration
InfiltrationNet 1
InfiltrationNet 2
InfiltrationNet 3
Cracks
CrackNet 1
CrackNet 2
CrackNet 3
MULTIPLE CLASSIFIER SYSTEM
Final Deposit
Final Reduction Output
Final Misalig. Output
Final Infilt. Output
Final Cracks Output

FIGURE 10

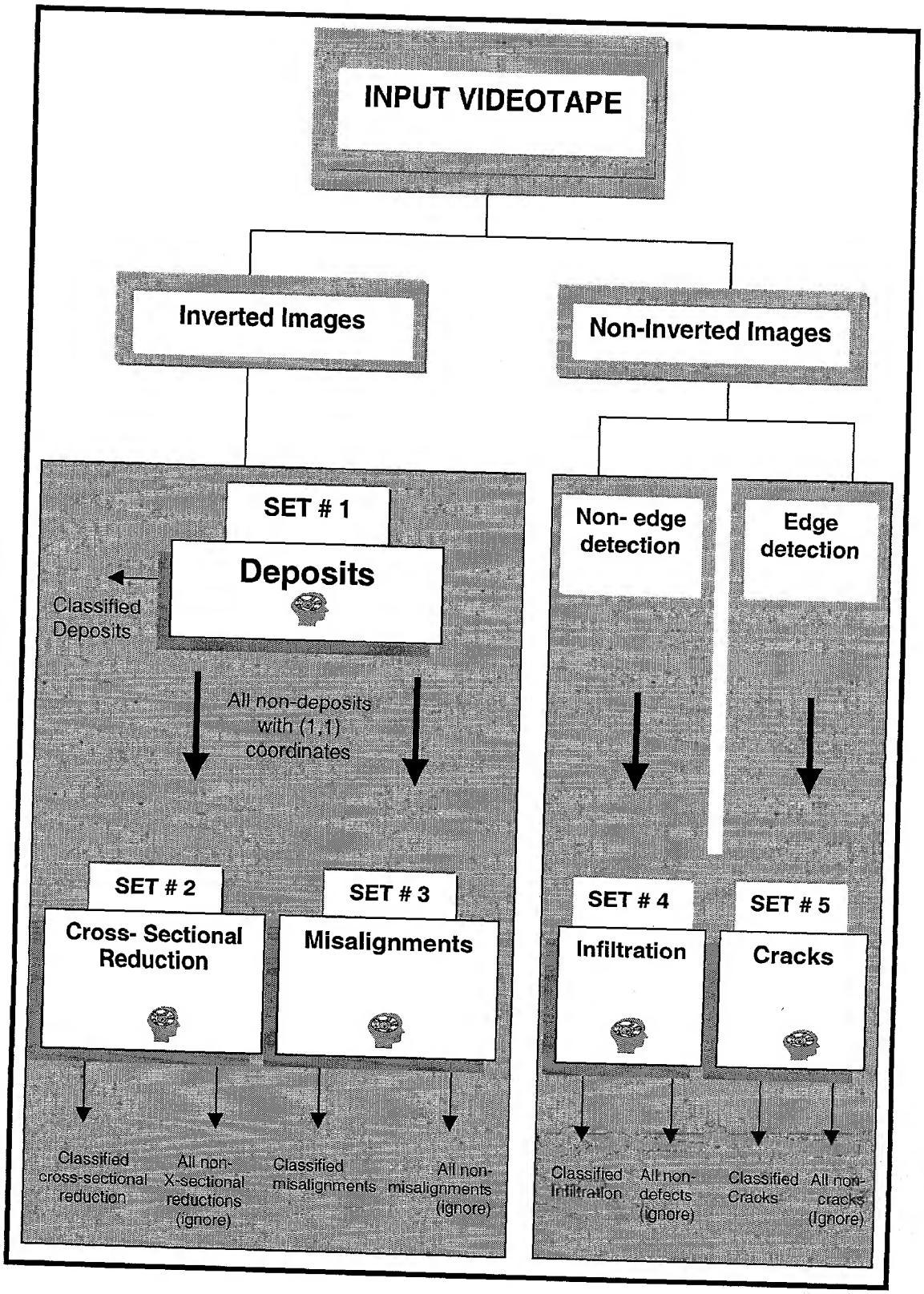

INPUT VIDEOTAPE
Inverted Images
Non-Inverted Images
SET # 1
Deposits
Classified Deposits
All non-deposits with (1,1) coordinates
Non- edge detection
Edge detection
SET # 2
Cross- Sectional Reduction
SET # 3
Misalignments
SET # 4
Infiltration
SET # 5
Cracks
Classified cross-sectional reduction
All non-X-sectional reductions (ignore)
Classified misalignments
All non-misalignments (ignore)
Classified Infiltration
All non-defects (ignore)
Classified Cracks
All non-cracks (Ignore)

FIGURE 11

Substitute Specification

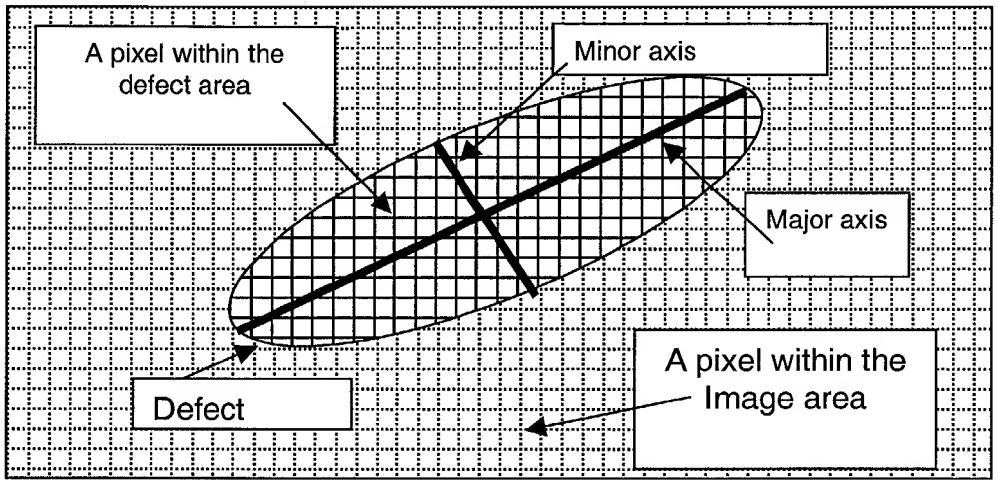


FIGURE 12

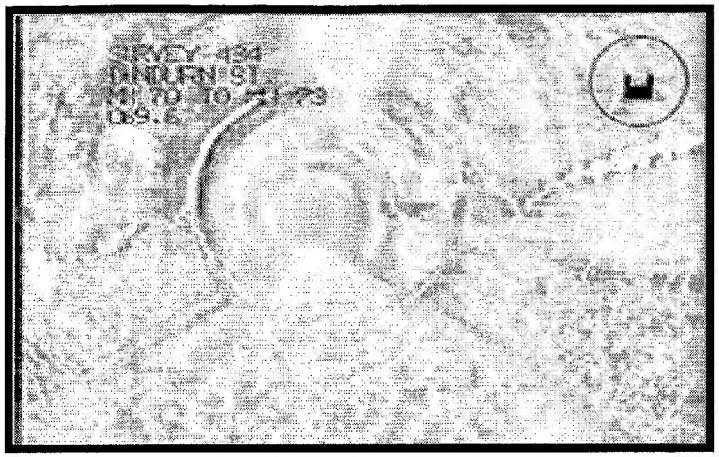


FIGURE 13

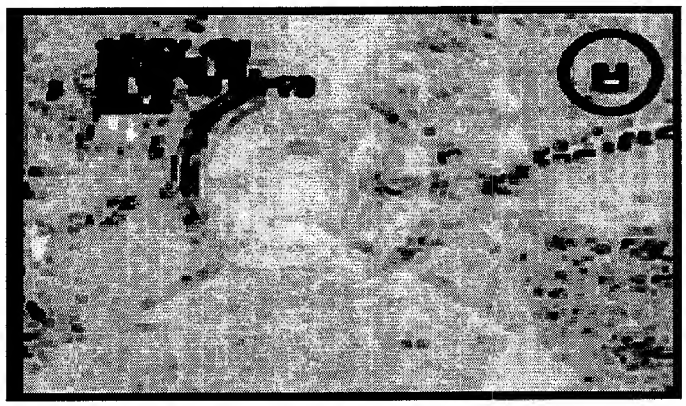


FIGURE 15

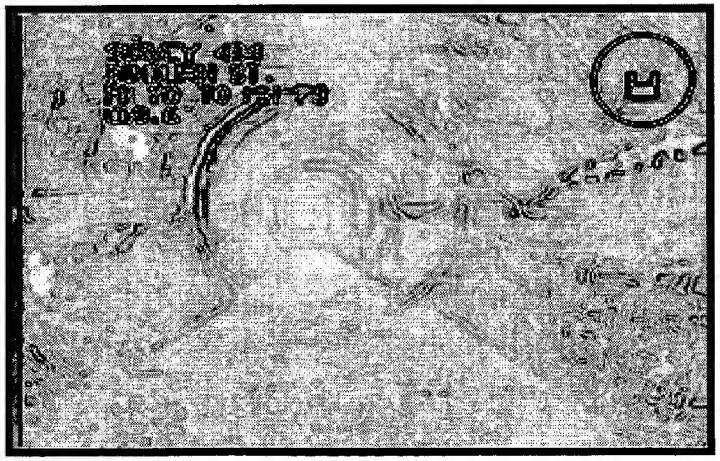


FIGURE 14

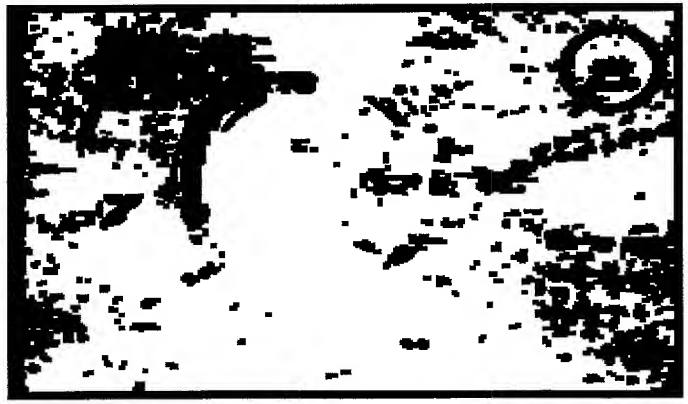


FIGURE 16

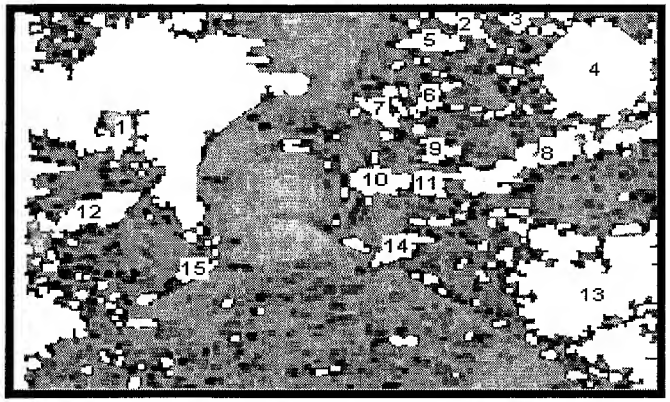


FIGURE 17

Results

	Area	Mean	S.D.	X	Y	Length	Major
1.	10298.00	190.81	66.39	53.65	71.71	1524.50	158.94
2.	243.00	128.24	43.82	219.07	7.41	104.81	28.39
3.	136.00	111.10	21.24	244.56	4.30	65.70	17.86
4.	2159.00	188.20	70.57	282.51	35.62	368.13	61.65
5.	292.00	131.72	32.81	202.45	17.68	89.01	31.38
6.	192.00	109.64	23.06	202.17	51.82	118.71	24.13
7.	241.00	130.94	42.37	178.54	59.96	101.64	23.34
8.	1345.00	168.22	65.38	259.09	87.75	399.50	95.43
9.	185.00	140.76	49.97	205.39	84.36	68.87	17.46
10.	356.00	143.16	44.28	176.45	103.95	96.43	29.89
11.	177.00	137.53	39.02	201.72	105.62	56.63	18.03
12.	591.00	142.98	50.42	37.24	123.74	175.10	51.35
13.	4009.00	145.72	47.18	281.45	174.64	761.11	88.82
14.	251.00	136.23	42.46	186.72	144.71	90.08	30.47
15.	136.00	119.99	31.48	88.65	158.98	59.84	22.41

FIGURE 18

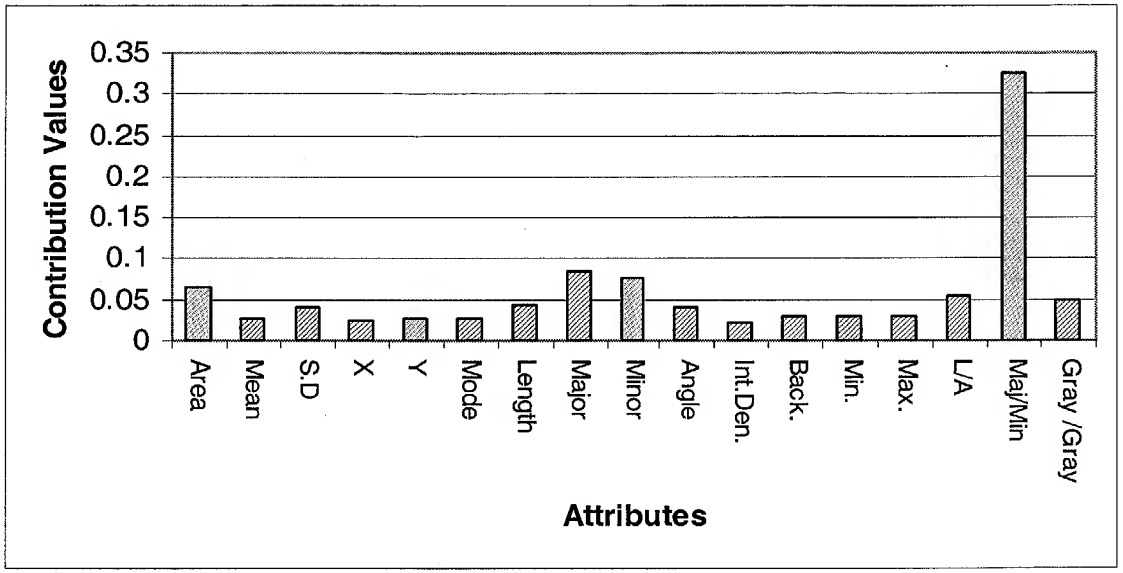

Contribution Values
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Area
Mean
S.D
X
Y
Mode
Length
Major
Minor
Angle
Int.Den.
Back.
Min.
Max.
L/A
Maj/Min
Gray /Gray
Attributes

FIGURE 19

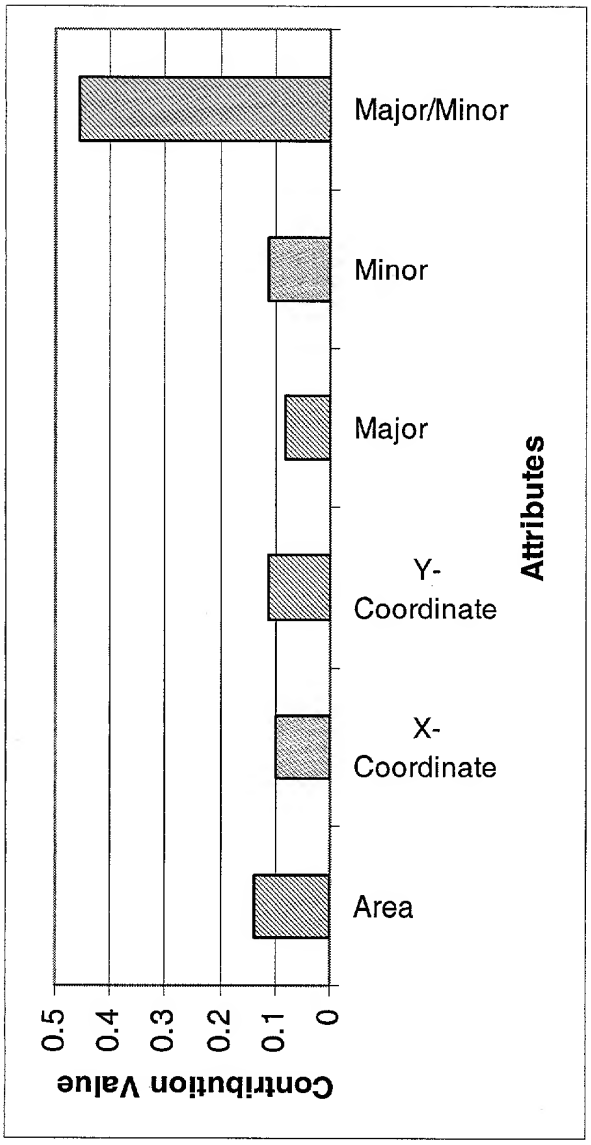

Major/Minor
Minor
Major
Y-
Coordinate
X-
Coordinate
Area
Attributes
0.5
0.4
0.3
0.2
0.1
0
Contribution Value

FIGURE 20

BEST AVAILABLE COPY

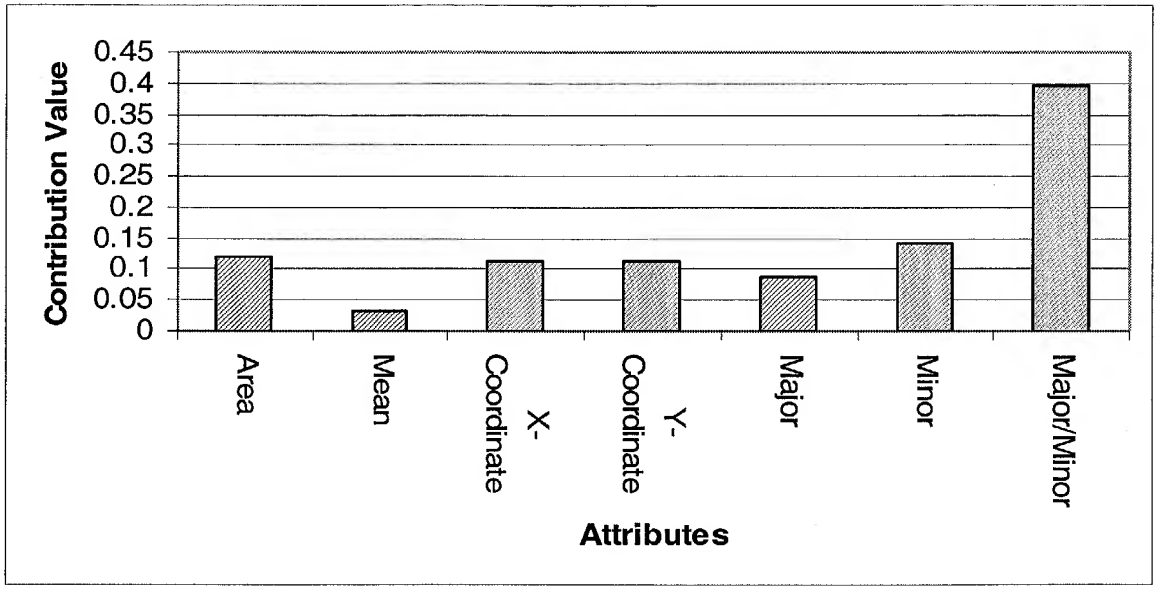


FIGURE 21

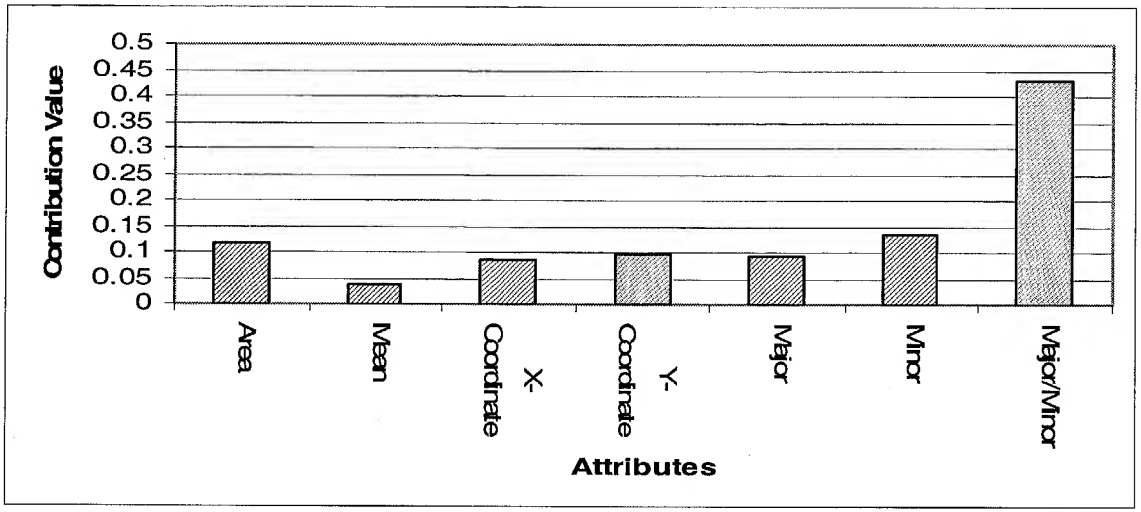


FIGURE 22

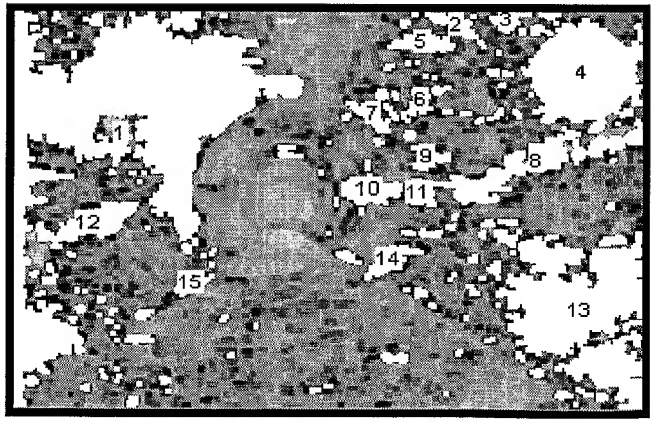


FIGURE 23

File Edit Format Help

Number of row with variable names (blank if none):

First row containing actual training data: 2

☒ left/right arrow keys end edit

Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.

	D	E	F	G
2	0.035929877311	0.968737125397		
3	0.114000715315	0.886296689510		
4	0.000000000000	1.000000000000		
5	0.000000000000	1.000000000000		
6	0.100026234984	0.900299847126		
7	0.031811475754	0.968877077103		
8	0.000000000000	1.000000000000		
9	0.893140494823	0.104359865189		
10	0.019607180730	0.980554997921		
11	0.003982819617	0.989578843117		
12	0.005694665015	0.995122373104		
13	0.573563754559	0.428812980652		
14	0.044550366700	0.963026463985		
15	0.421342730522	0.578073859215		
16	0.706838846207	0.292702466249		
17				
18				

FIGURE 24

File Edit Format Help

Number of row with variable names (blank if none):

First row containing actual training data: 2

☒ left/right arrow keys end edit

Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.

	D	E	F	G
2	----------	Else		
3	----------	Else		
4	----------	Else		
5	----------	Else		
6	----------	Else		
7	----------	Else		
8	----------	Else		
9	Crack	----------		
10	----------	Else		
11	----------	Else		
12	----------	Else		
13	Crack	----------		
14	----------	Else		
15	----------	Else		
16	Crack	----------		
17				
18				

FIGURE 25

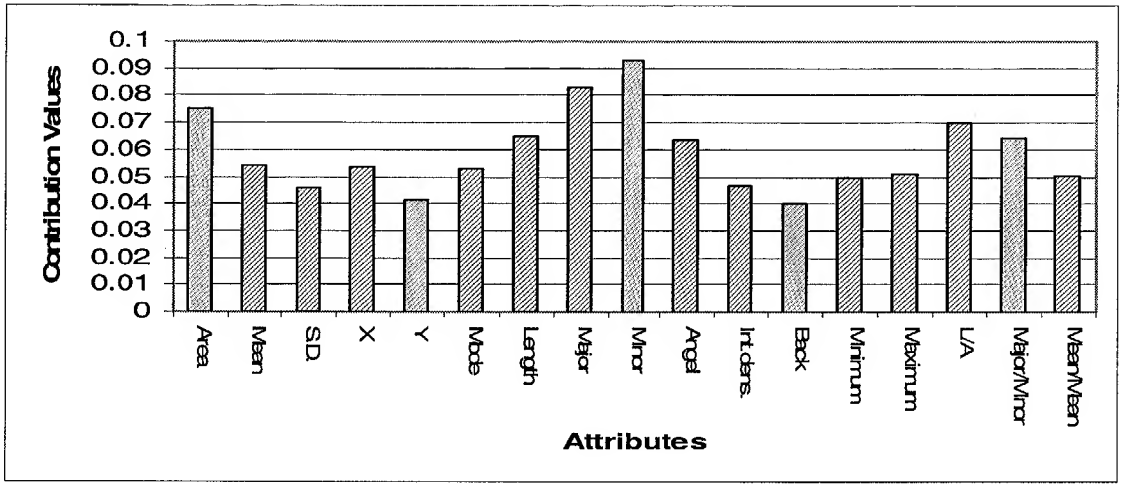

Contribution Values
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Area
Mean
SD
X
Y
Mode
Length
Major
Minor
Angel
Int.dens.
Back
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

FIGURE 26

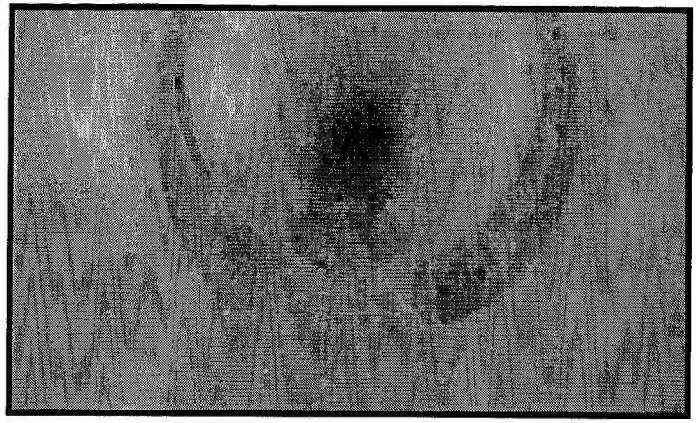


FIGURE 27

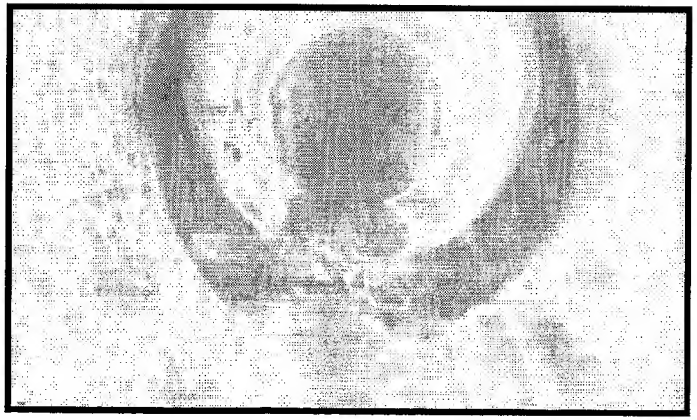


FIGURE 28

FIGURE 29

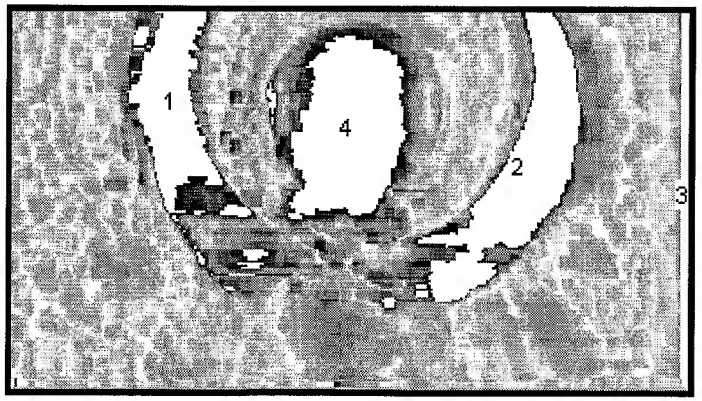


FIGURE 30

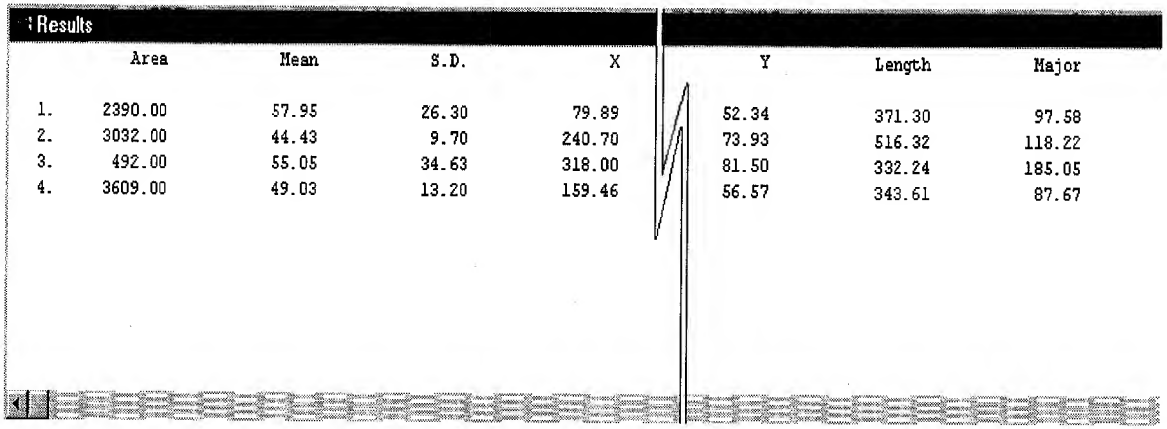

Results
Area Mean S.D. X Y Length Major
1. 2390.00 57.95 26.30 79.89 52.34 371.30 97.58
2. 3032.00 44.43 9.70 240.70 73.93 516.32 118.22
3. 492.00 55.05 34.63 318.00 81.50 332.24 185.05
4. 3609.00 49.03 13.20 159.46 56.57 343.61 87.67

FIGURE 31

REDACTED

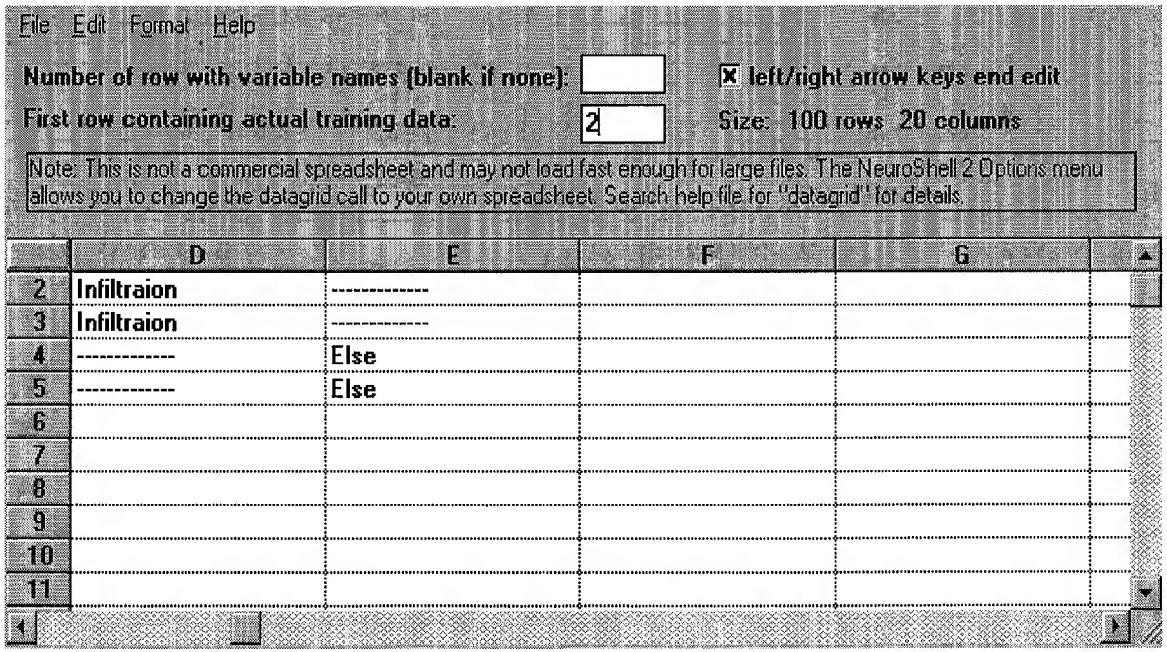


FIGURE 32

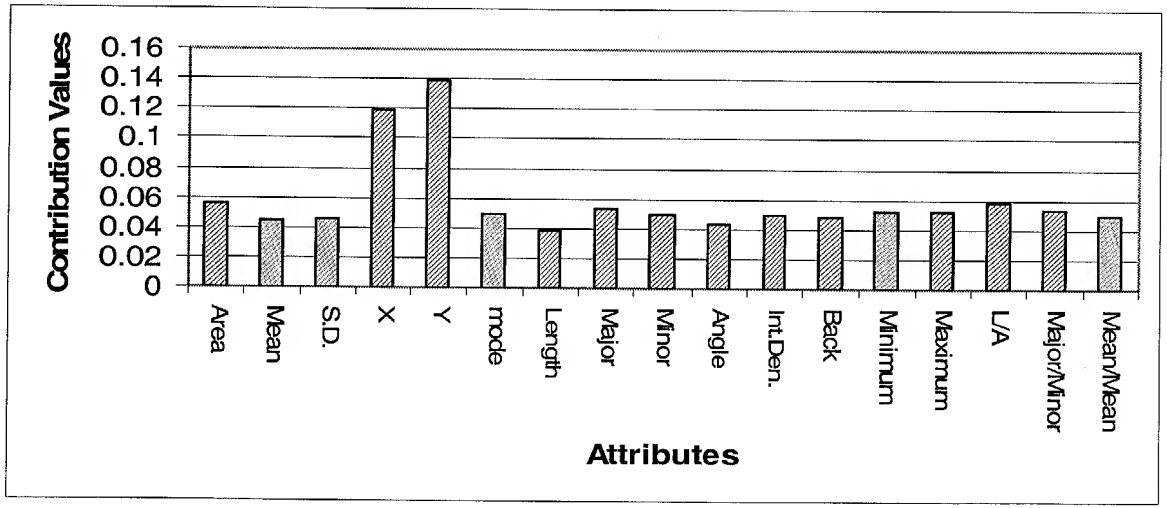

Contribution Values
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
X
Y
mode
Length
Major
Minor
Angle
Int.Den.
Back
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

FIGURE 33

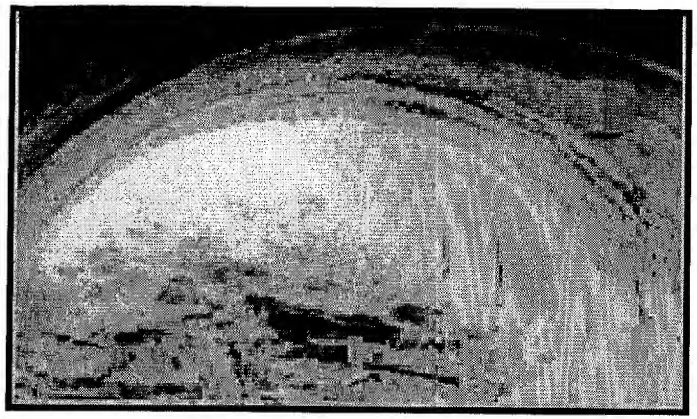


FIGURE 34

FIGURE 35

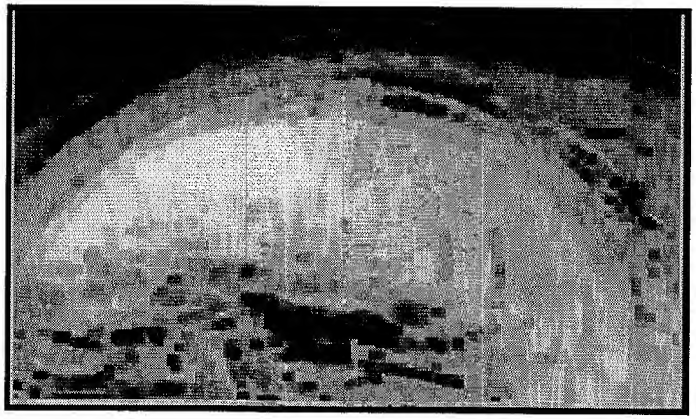


FIGURE 36

FIGURE 37

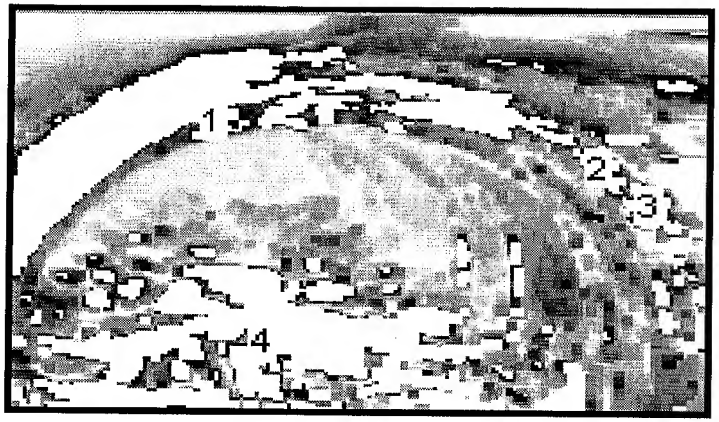


FIGURE 38

Results

	Area	Mean	S.D.	X	Y	Length	Major
1.	2652.00	80.03	22.30	55.52	37.85	715.94	109.69
2.	108.00	68.61	14.66	161.80	53.11	55.60	17.59
3.	144.00	71.94	16.32	175.35	66.67	70.43	18.30
4.	2972.00	96.81	34.10	69.02	114.82	870.18	98.21

FIGURE 39

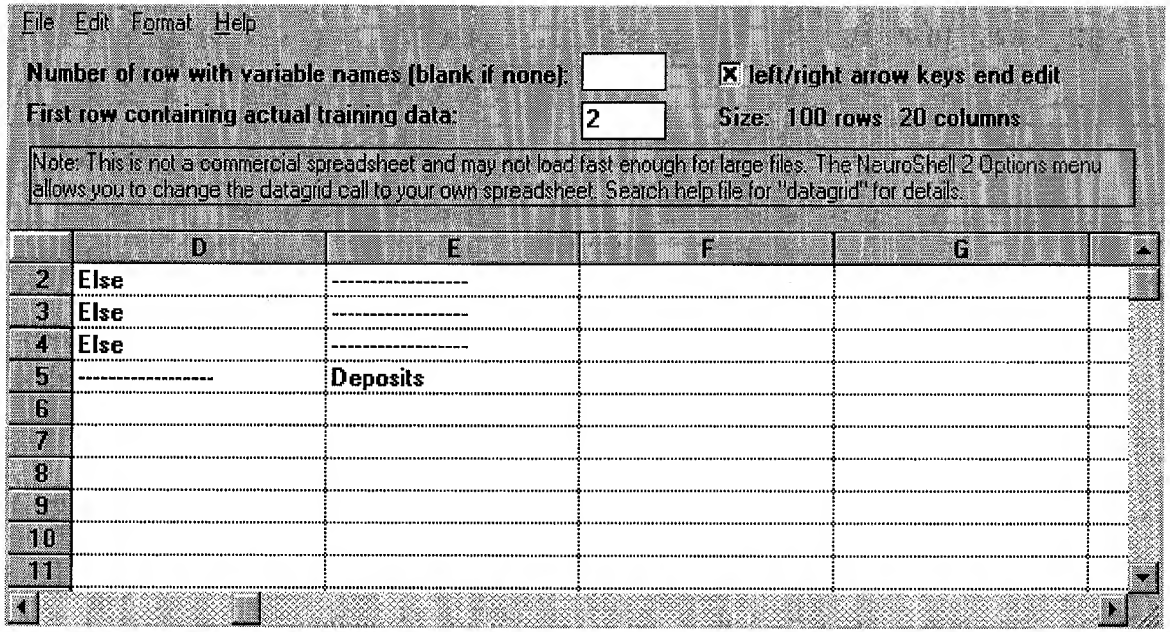

File Edit Format Help
Number of row with variable names (blank if none):
left/right arrow keys end edit
First row containing actual training data:
2
Size: 100 rows 20 columns
Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.
D
E
F
G
2 Else ----------
3 Else ----------
4 Else ----------
5 ---------- Deposits
6
7
8
9
10
11

FIGURE 40

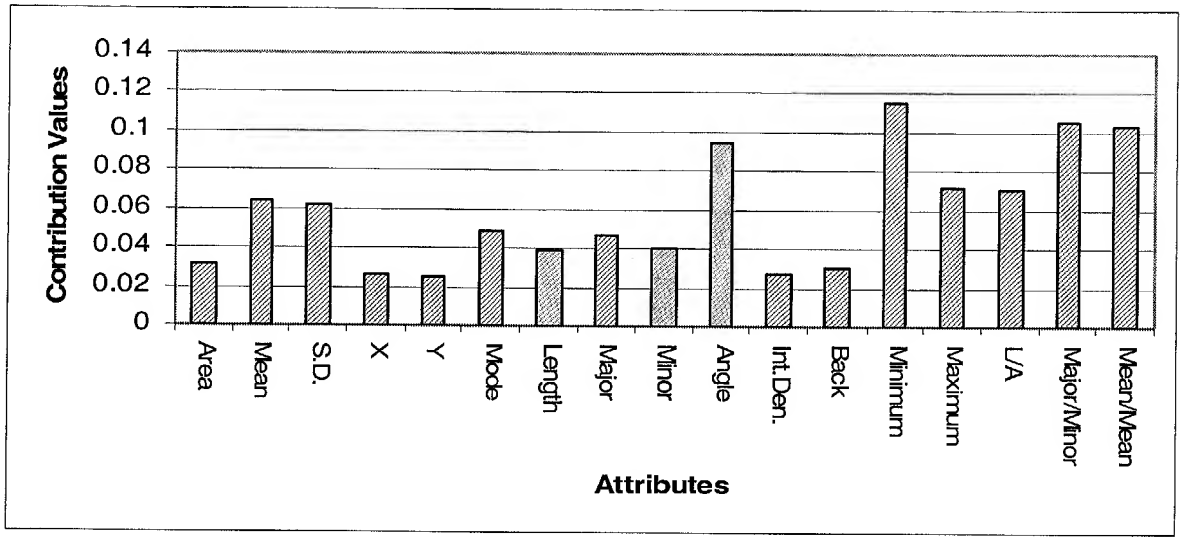

Contribution Values
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
X
Y
Mode
Length
Major
Minor
Angle
Int.Den.
Back
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

FIGURE 41

FIGURE 42

FIGURE 43

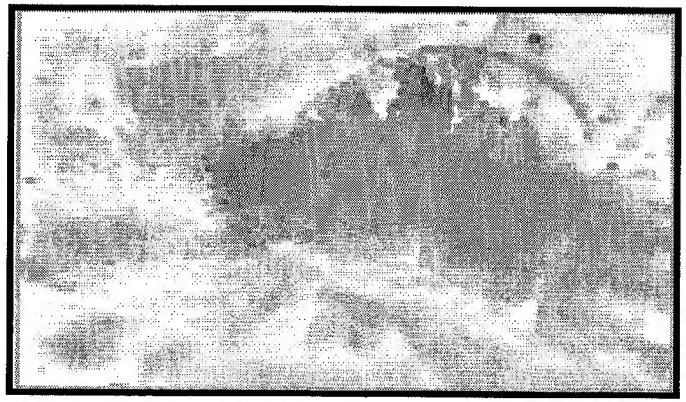


FIGURE 44

FIGURE 45

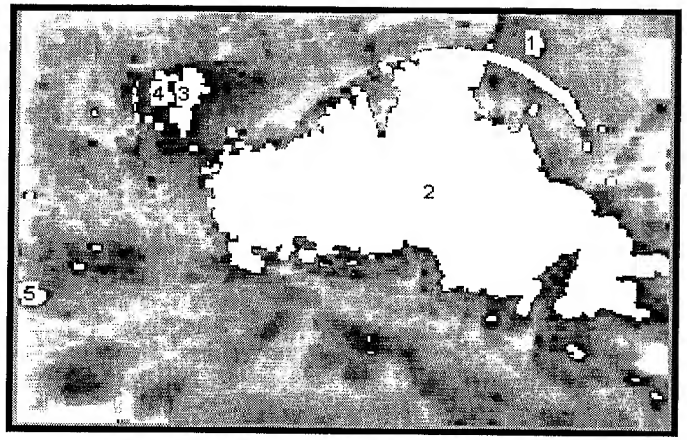
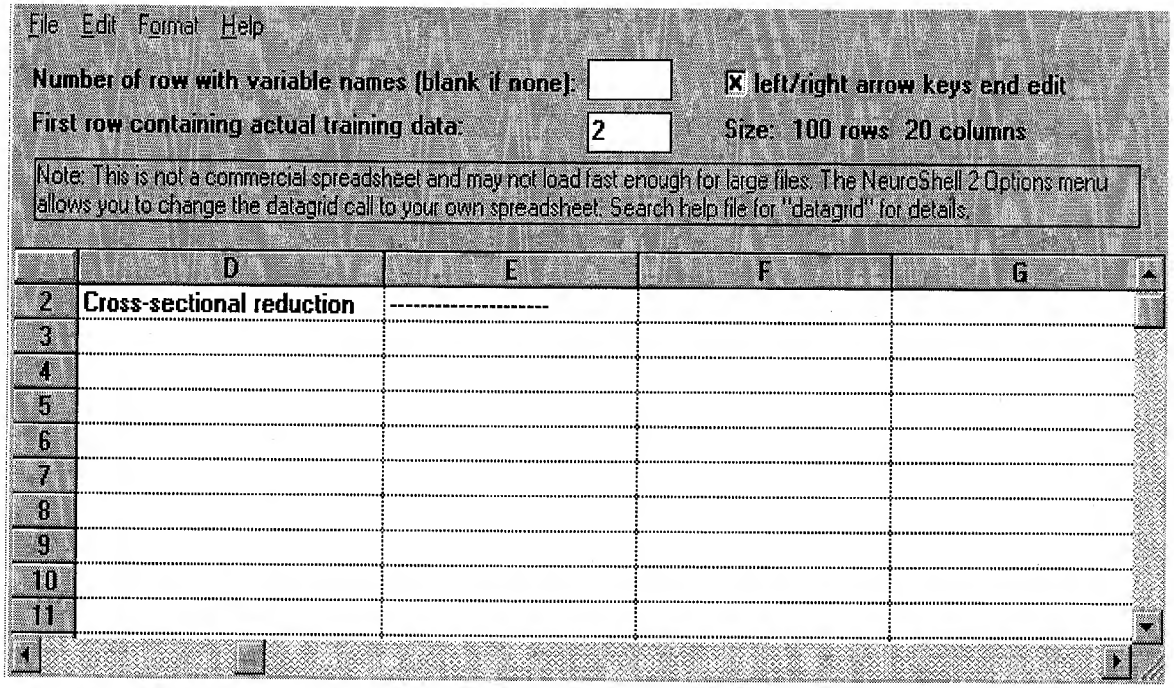


FIGURE 46

Results

	Area	Mean	S.D.	X	Y	Length	Major
1.	76.00	90.84	55.80	256.92	16.22	38.04	12.60
2.	17141.00	77.01	17.65	206.03	102.46	1347.63	196.15
3.	433.00	51.68	4.15	82.04	47.86	149.88	32.95
4.	63.00	49.22	2.34	70.62	47.83	36.38	13.25
5.	105.00	53.85	6.10	6.34	162.71	45.56	15.40

FIGURE 47


File Edit Format Help
Number of row with variable names (blank if none):
First row containing actual training data:
2
left/right arrow keys end edit
Size: 100 rows 20 columns
Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.
D
E
F
G
2
Cross-sectional reduction

3
4
5
6
7
8
9
10
11

FIGURE 48

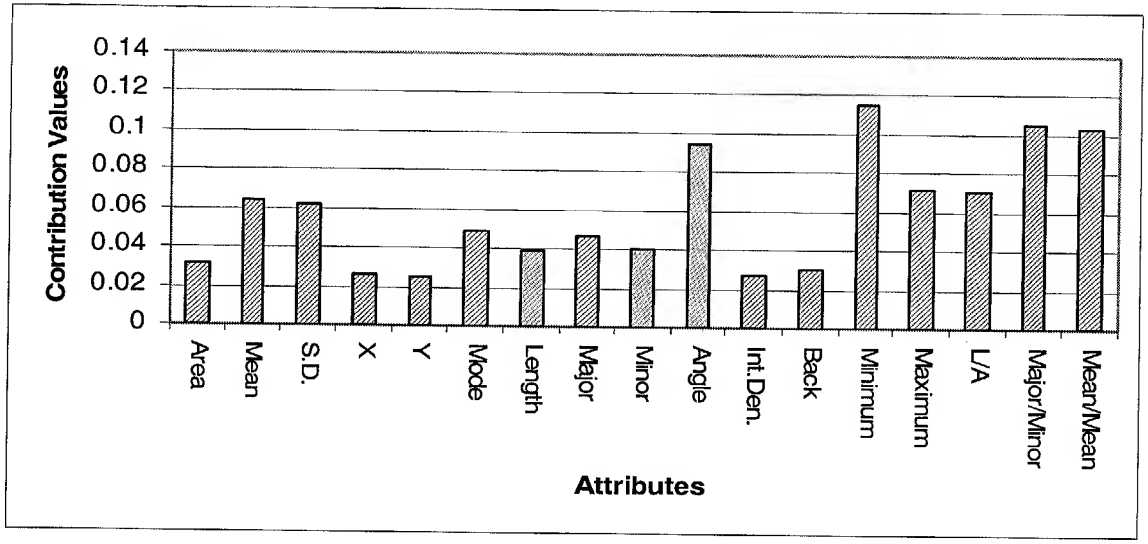

Contribution Values
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
X
Y
Mode
Length
Major
Minor
Angle
Int.Den.
Back
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

TABLE 49

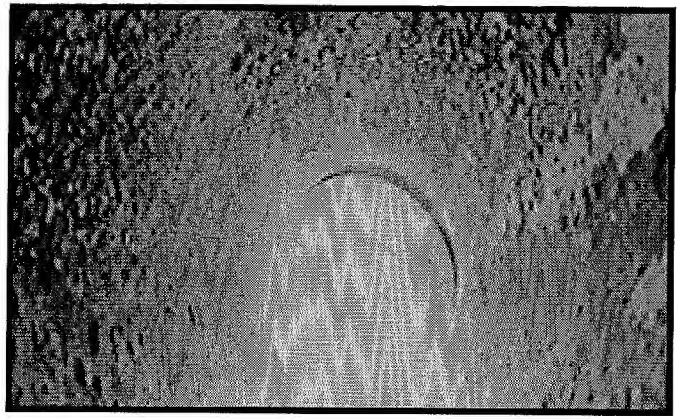


FIGURE 50

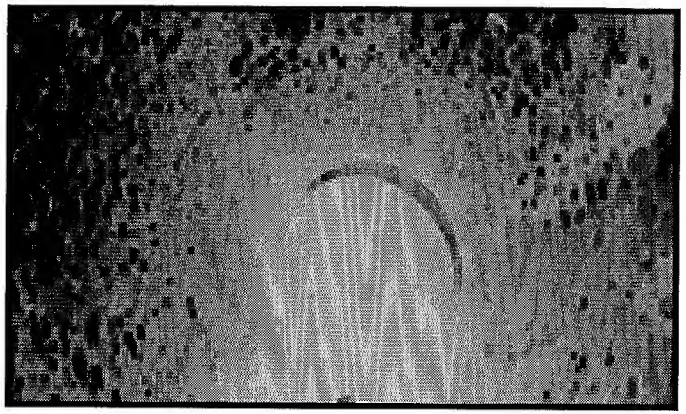


FIGURE 51

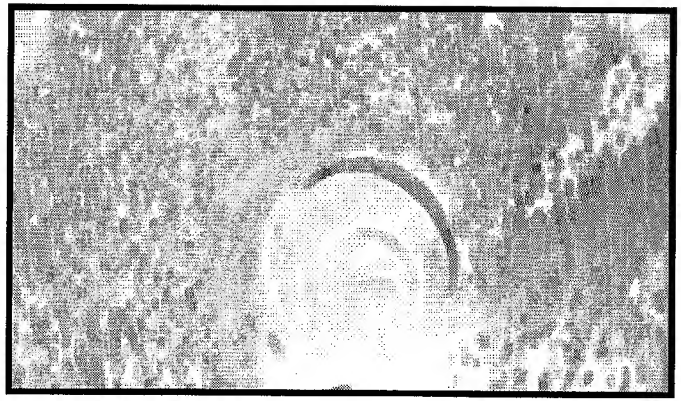


FIGURE 52

FIGURE 53

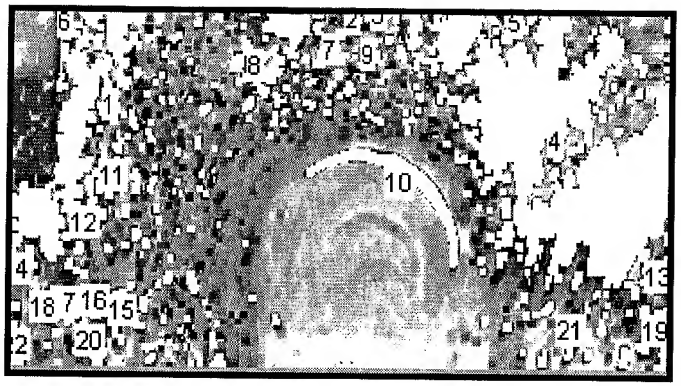
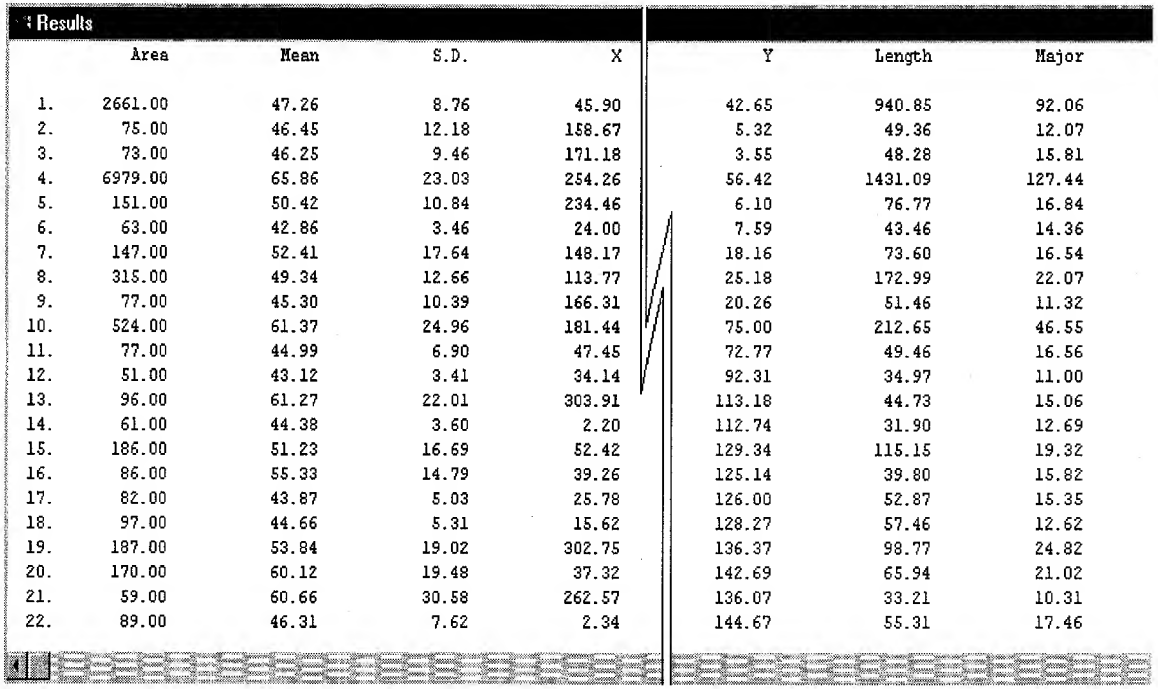


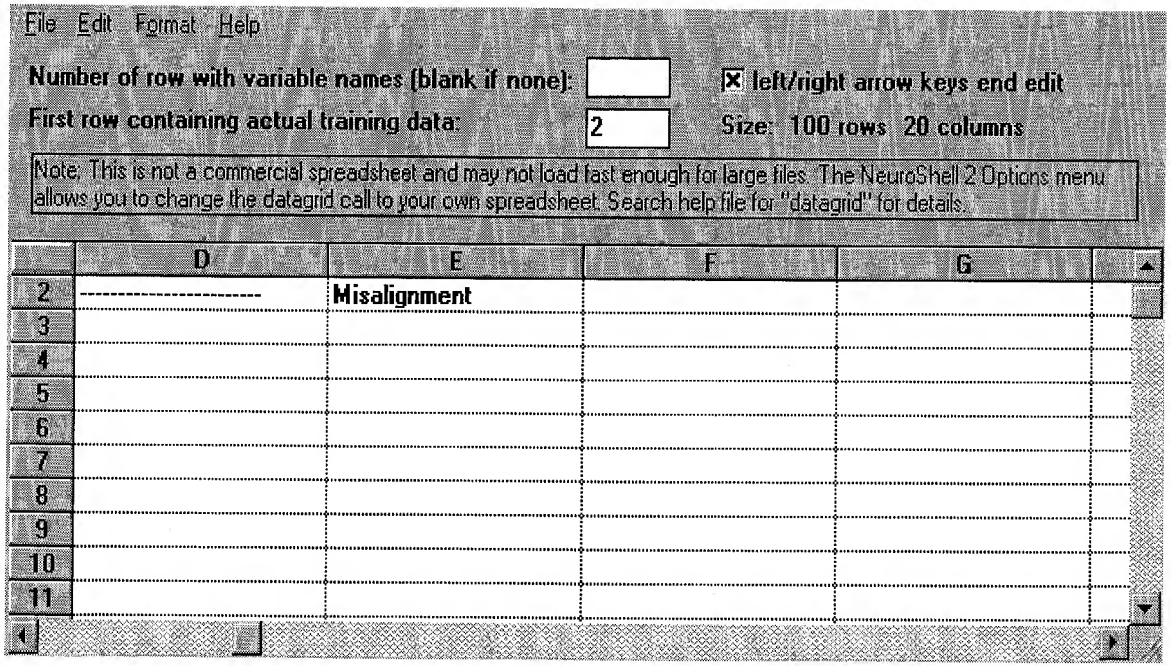
FIGURE 54



Results

	Area	Mean	S.D.	X	Y	Length	Major
1.	2661.00	47.26	8.76	45.90	42.65	940.85	92.06
2.	75.00	46.45	12.18	158.67	5.32	49.36	12.07
3.	73.00	46.25	9.46	171.18	3.55	48.28	15.81
4.	6979.00	65.86	23.03	254.26	56.42	1431.09	127.44
5.	151.00	50.42	10.84	234.46	6.10	76.77	16.84
6.	63.00	42.86	3.46	24.00	7.59	43.46	14.36
7.	147.00	52.41	17.64	148.17	18.16	73.60	16.54
8.	315.00	49.34	12.66	113.77	25.18	172.99	22.07
9.	77.00	45.30	10.39	166.31	20.26	51.46	11.32
10.	524.00	61.37	24.96	181.44	75.00	212.65	46.55
11.	77.00	44.99	6.90	47.45	72.77	49.46	16.56
12.	51.00	43.12	3.41	34.14	92.31	34.97	11.00
13.	96.00	61.27	22.01	303.91	113.18	44.73	15.06
14.	61.00	44.38	3.60	2.20	112.74	31.90	12.69
15.	186.00	51.23	16.69	52.42	129.34	115.15	19.32
16.	86.00	55.33	14.79	39.26	125.14	39.80	15.82
17.	82.00	43.87	5.03	25.78	126.00	52.87	15.35
18.	97.00	44.66	5.31	15.62	128.27	57.46	12.62
19.	187.00	53.84	19.02	302.75	136.37	98.77	24.82
20.	170.00	60.12	19.48	37.32	142.69	65.94	21.02
21.	59.00	60.66	30.58	262.57	136.07	33.21	10.31
22.	89.00	46.31	7.62	2.34	144.67	55.31	17.46

FIGURE 55


File Edit Format Help
Number of row with variable names (blank if none):
left/right arrow keys end edit
First row containing actual training data:
2
Size: 100 rows 20 columns
Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.
D
E
F
G
2

Misalignment
3
4
5
6
7
8
9
10
11

FIGURE 56

FIGURE 57

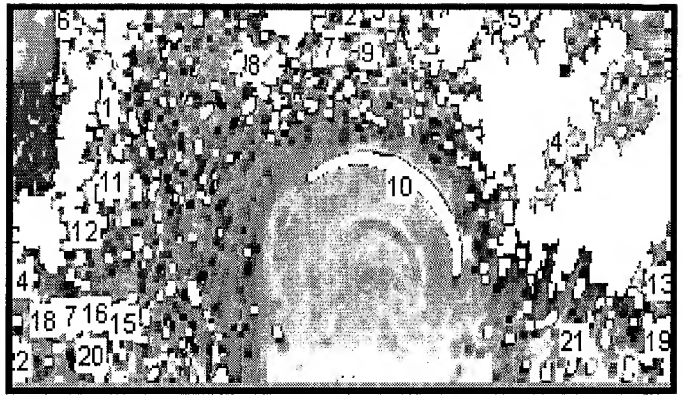


FIGURE 58

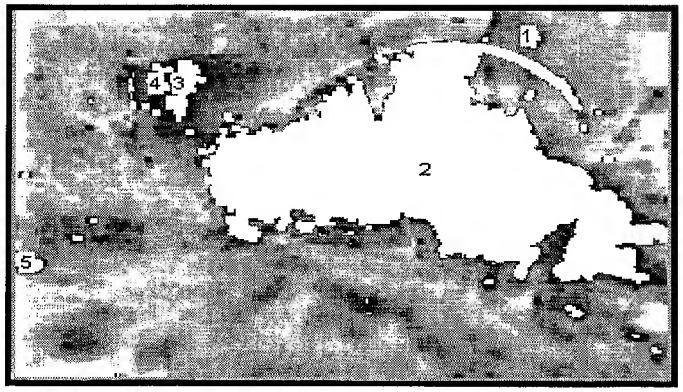


FIGURE 59

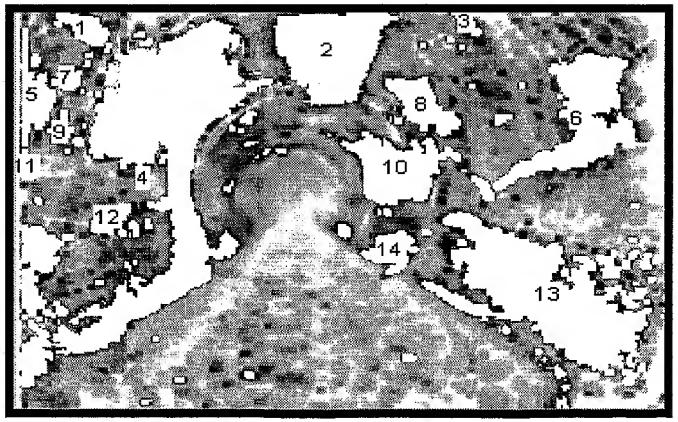


FIGURE 60

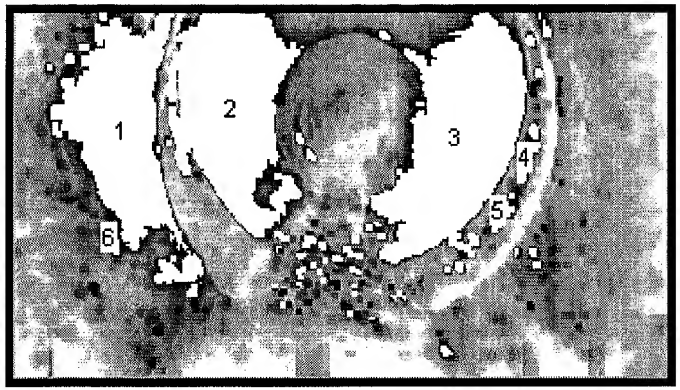


FIGURE 61

File Edit Format Help

Number of row with variable names (blank if none): [ ] ☒ left/right arrow keys end edit

First row containing actual training data: [1] Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options men "datagrid" for details.

	D	E	F	G
1	Else	----------		
2	Else	----------		
3	Else	----------		
4	----------	Deposits		
5				
6				
7	Else	----------		
8	Else	----------		
9	Else	----------		
10	Else	----------		
11	Else	----------		
12	Else	----------		
13	Else	----------		
14	Else	----------		
15	Else	----------		
16	Else	----------		
17	Else	----------		
18	Else	----------		
19	Else	----------		
20	Else	----------		
21	Else	----------		
22	Else	----------		
23	Else	----------		
24	Else	----------		
25	Else	----------		
26	Else	----------		
27	Else	----------		
28	Else	----------		
29				
30				

FIGURE 62A

	D	E	F	G
31	Else	----------		
32	Else	----------		
33	Else	----------		
34	Else	----------		
35	Else	----------		
36				
37				
38	Else	----------		
39	Else	----------		
40	Else	----------		
41	Else	----------		
42	Else	----------		
43	Else	----------		
44	Else	----------		
45	Else	----------		
46	Else	----------		
47	Else	----------		
48	Else	----------		
49	Else	----------		
50	Else	----------		
51	Else	----------		
52				
53				
54	Else	----------		
55	Else	----------		
56	Else	----------		
57	Else	----------		
58	Else	----------		
59	Else	----------		
60				
61				

FIGURE 62B

File Edit Format Help

Number of row with variable names (blank if none): [ ] ☒ left/right arrow keys end edit

First row containing actual training data: [1] Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options mer "datagrid" for details.

	D	E	F	G
1	Else	----------		
2	Else	----------		
3	Else	----------		
4	----------	Deposits		
5				
6				
7	Else	----------		
8	Else	----------		
9	Else	----------		
10	Else	----------		
11	Else	----------		
12	Else	----------		
13	Else	----------		
14	Else	----------		
15	Else	----------		
16	Else	----------		
17	Else	----------		
18	Else	----------		
19	Else	----------		
20	Else	----------		
21	Else	----------		
22	Else	----------		
23	Else	----------		
24	Else	----------		
25	Else	----------		
26	Else	----------		
27	Else	----------		
28	Else	----------		
29				

FIGURE 63A

	D	E	F	G
30				
31	Else	----------		
32	Else	----------		
33	Else	----------		
34	Else	----------		
35	Else	----------		
36				
37				
38	Else	----------		
39	Else	----------		
40	Else	----------		
41	Else	----------		
42	Else	----------		
43	Else	----------		
44	Else	----------		
45	Else	----------		
46	Else	----------		
47	Else	----------		
48	Else	----------		
49	Else	----------		
50	Else	----------		
51	Else	----------		
52				
53				
54	Else	----------		
55	Else	----------		
56	Else	----------		
57	Else	----------		
58	Else	----------		
59	Else	----------		
60				

FIGURE 63B

File Edit Format Help

Number of row with variable names (blank if none):

First row containing actual training data: 1

☒ left/right arrow keys end edit

Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options mer "datagrid" for details.

	D	E	F	G
1	Else	----------		
2	Else	----------		
3	Else	----------		
4	----------	Deposits		
5				
6				
7	Else	----------		
8	Else	----------		
9	Else	----------		
10	Else	----------		
11	Else	----------		
12	Else	----------		
13	Else	----------		
14	Else	----------		
15	Else	----------		
16	Else	----------		
17	Else	----------		
18	Else	----------		
19	Else	----------		
20	Else	----------		
21	Else	----------		
22	Else	----------		
23	Else	----------		
24	Else	----------		
25	Else	----------		
26	Else	----------		
27	Else	----------		
28	Else	----------		

FIGURE 64A

	D	E	F	G
29				
30				
31	Else	----------		
32	Else	----------		
33	Else	----------		
34	Else	----------		
35	Else	----------		
36				
37				
38	Else	----------		
39	Else	----------		
40	Else	----------		
41	Else	----------		
42	Else	----------		
43	Else	----------		
44	Else	----------		
45	Else	----------		
46	Else	----------		
47	Else	----------		
48	Else	----------		
49	Else	----------		
50	Else	----------		
51	Else	----------		
52				
53				
54	Else	----------		
55	Else	----------		
56	Else	----------		
57	Else	----------		
58	Else	----------		
59	Else	----------		

FIGURE 64B

	AA	AB	AC	AD	AE	AF	AG	AH
1					Else			
2					Else			
3					Else			
4					Deposits			
5								
6								
7					Else			
8					Else			
9					Else			
10					Else			
11					Else			
12					Else			
13					Else			
14					Else			
15					Else			
16					Else			
17					Else			
18					Else			
19					Else			
20					Else			
21					Else			
22					Else			
23					Else			
24					Else			
25					Else			
26					Else			
27					Else			
28					Else			

FIGURE 65A

	AA	AB	AC	AD	AE	AF	AG	AH
31					Else			
32					Else			
33					Else			
34					Else			
35					Else			
36								
37								
38					Else			
39					Else			
40					Else			
41					Else			
42					Else			
43					Else			
44					Else			
45					Else			
46					Else			
47					Else			
48					Else			
49					Else			
50					Else			
51					Else			
52								
53								
54					Else			
55					Else			
56					Else			
57					Else			
58					Else			
59					Else			

FIGURE 65B

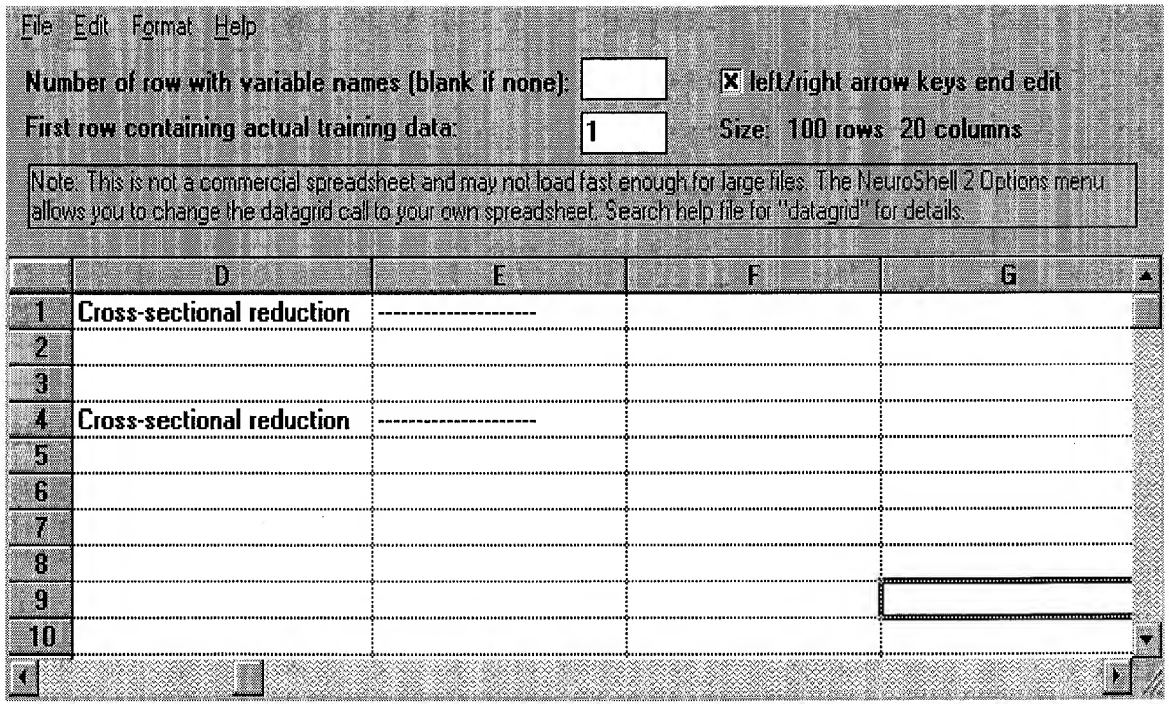

File Edit Format Help
Number of row with variable names (blank if none):
left/right arrow keys end edit
First row containing actual training data:
1
Size: 100 rows 20 columns
Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.
D
E
F
G
1 Cross-sectional reduction ----------
4 Cross-sectional reduction ----------

FIGURE 66

PCT/US97/23183

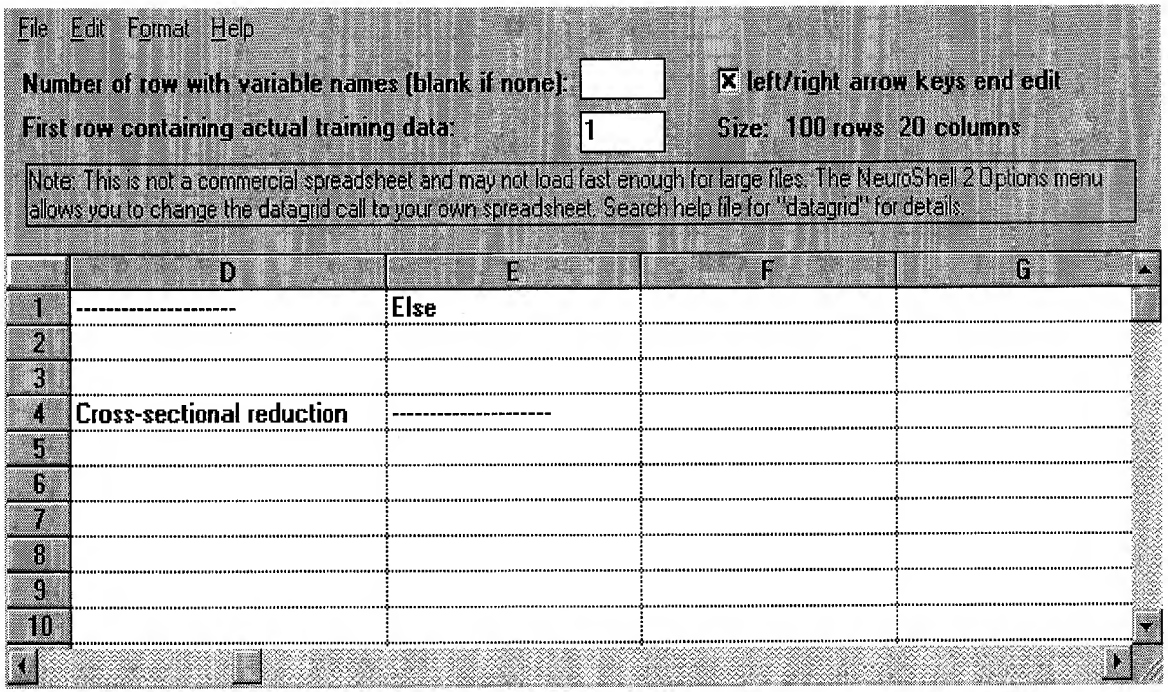


FIGURE 67

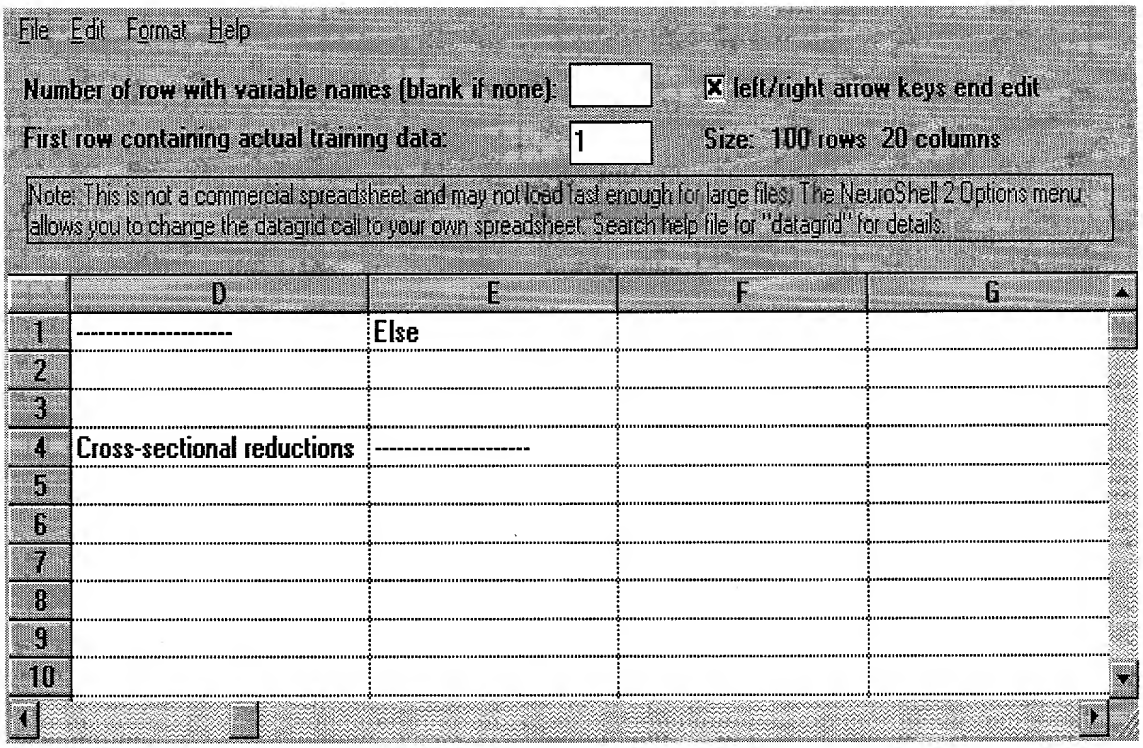

File Edit Format Help
Number of row with variable names (blank if none):
left/right arrow keys end edit
First row containing actual training data:
1
Size: 100 rows 20 columns
Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.
D
E
F
G
1 ---------- Else
4 Cross-sectional reductions ----------

FIGURE 68

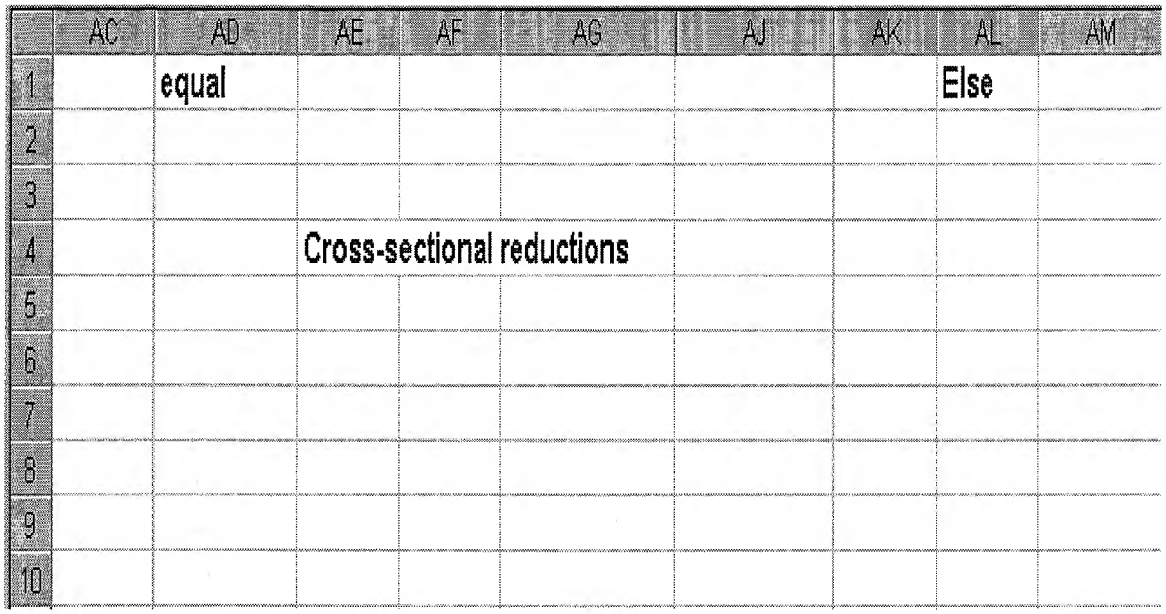

AC
AD
AE
AF
AG
AJ
AK
AL
AM
1
equal
Else
2
3
4
Cross-sectional reductions
5
6
7
8
9
10

FIGURE 69

File Edit Format Help

Number of row with variable names (blank if none): [ ] ☒ left/right arrow keys end edit

First row containing actual training data: [1] Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.

	D	E	F	G
1	----------	Misalignment		
2				
3				
4	Else	----------		
5				
6				
7				
8				
9				
10				

FIGURE 70

File Edit Format Help

Number of row with variable names (blank if none): [ ] ☒ left/right arrow keys end edit

First row containing actual training data: [1] Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.

	D	E	F	G
1	----------	Misalignment		
2				
3				
4	Else	----------		
5				
6				
7				
8				
9				
10				
11				

FIGURE 71

File Edit Format Help

Number of row with variable names (blank if none): ☒ left/right arrow keys end edit

First row containing actual training data: 1 Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options menu allows you to change the datagrid call to your own spreadsheet. Search help file for "datagrid" for details.

	D	E	F	G
1	----------	Misalignment		
2				
3				
4	----------	----------		
5				
6				
7				
8				
9				
10				

FIGURE 72

	AA	AB	AC	AD	AE	AF	AG
1					Misalignment		
2							
3							
4				equal	Else		
5							
6							
7							
8							
9							
10							

FIGURE 73

FIGURE 74

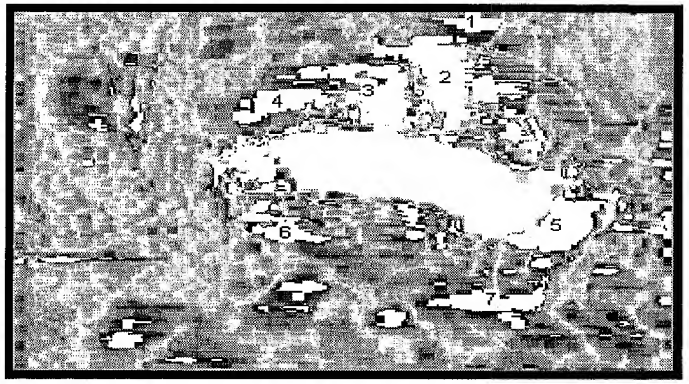


FIGURE 75

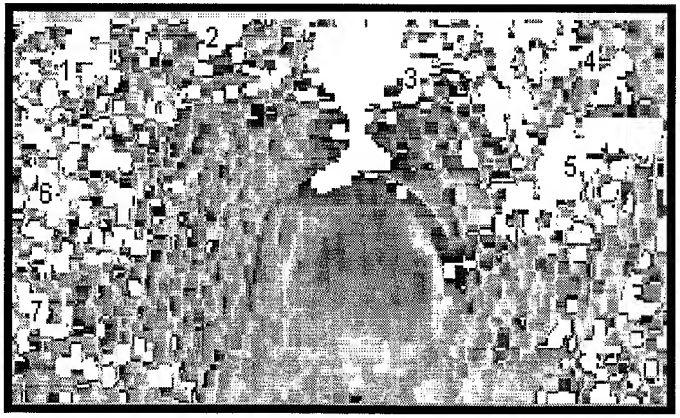


FIGURE 76

FIGURE 77

FIGURE 78

File Edit Format Help

Number of row with variable names (blank if none): [ ] [x] left/right arrow keys end edit

First row containing actual training data: [1] Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options men
"datagrid" for details.

	D	E	F	G
1	----------	Else		
2	----------	Else		
3	----------	Else		
4	----------	Else		
5	----------	Else		
6	----------	Else		
7				
8				
9	----------	Else		
10	----------	Else		
11	----------	Else		
12	----------	Else		
13	----------	Else		
14	----------	Else		
15	----------	Else		
16				
17				

FIGURE 79A

	D	E	F	G
18	----------	Else		
19	----------	Else		
20	----------	Else		
21	----------	Else		
22	Infiltration	----------		
23	----------	Else		
24	----------	Else		
25				
26				
27	----------	Else		
28	----------	Else		
29	----------	Else		
30				
31				
32	Infiltration	----------		
33	Infiltration	----------		
34	----------	Else		
35	----------	Else		
36				

FIGURE 79B

File Edit Format Help

Number of row with variable names (blank if none): [ ] ☒ left/right arrow keys end edit

First row containing actual training data: [1] Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options men "datagrid" for details.

	D	E	F	G
1	----------	Else		
2	----------	Else		
3	----------	Else		
4	Infiltration	----------		
5	----------	Else		
6	----------	Else		
7				
8				
9	----------	Else		
10	----------	Else		
11	----------	Else		
12	----------	Else		
13	----------	Else		
14	----------	Else		
15	----------	Else		
16				

FIGURE 80A

	D	E	F	G
17				
18	----------	Else		
19	----------	Else		
20	----------	Else		
21	----------	Else		
22	----------	Else		
23	----------	Else		
24	----------	Else		
25				
26				
27	----------	Else		
28	Infiltration	----------		
29	----------	Else		
30				
31				
32	Infiltration	----------		
33	Infiltration	----------		
34	----------	Else		
35	----------	Else		
36				
37				

FIGURE 80B

File Edit Format Help

Number of row with variable names (blank if none): ☒ left/right arrow keys end edit

First row containing actual training data: 1 Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options mer "datagrid" for details.

	D	E	F	G
1	Infiltration	----------		
2	----------	Else		
3	----------	Else		
4	----------	Else		
5	----------	Else		
6	----------	Else		
7				
8				
9	----------	Else		
10	----------	Else		
11	----------	Else		
12	----------	Else		
13	----------	Else		
14	----------	Else		
15	----------	Else		
16				
17				

FIGURE 81A

	D	E	F	G
18	----------	Else		
19	----------	Else		
20	----------	Else		
21	----------	Else		
22	----------	Else		
23	----------	Else		
24	----------	Else		
25				
26				
27	----------	Else		
28	----------	Else		
29	----------	Else		
30				
31				
32	Infiltration	----------		
33	Infiltration	----------		
34	----------	Else		
35	----------	Else		
36				
37				
38				

FIGURE 81B

	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1			Else							
2			Else							
3			Else							
4		equal				Else				
5			Else							
6			Else							
7										
8										
9			Else							
10			Else							
11			Else							
12			Else							
13			Else							
14			Else							
15			Else							
16										
17										

FIGURE 82A

	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
18			Else							
19			Else							
20			Else							
21			Else							
22		equal								Else
23			Else							
24			Else							
25										
26										
27			Else							
28		equal				Else				
29			Else							
30										
31										
32			Infiltration							
33			Infiltration							
34			Else							
35			Else							
36										

FIGURE 82B

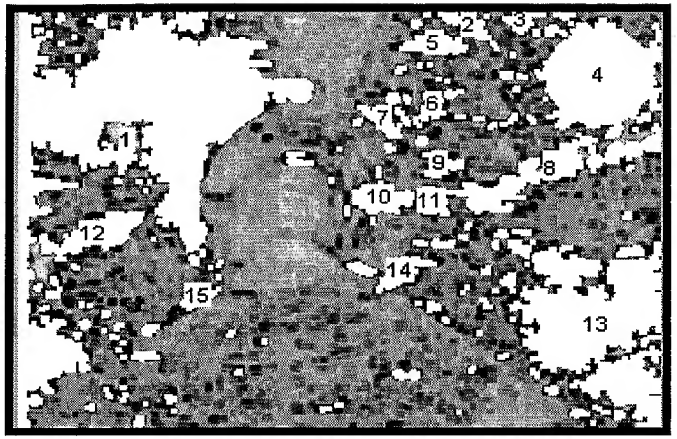


FIGURE 83

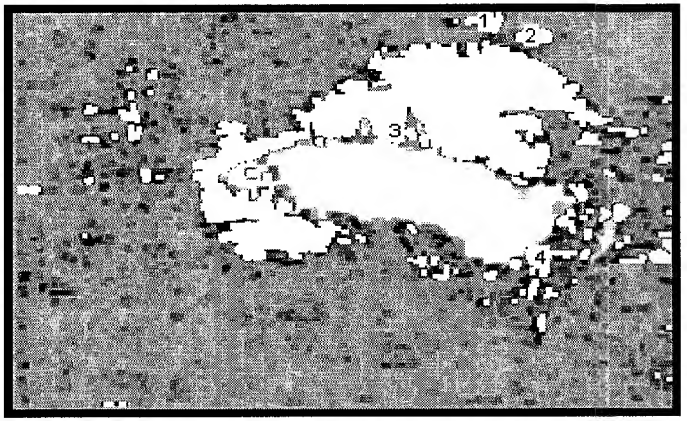


FIGURE 84

FIGURE 85

FIGURE 86

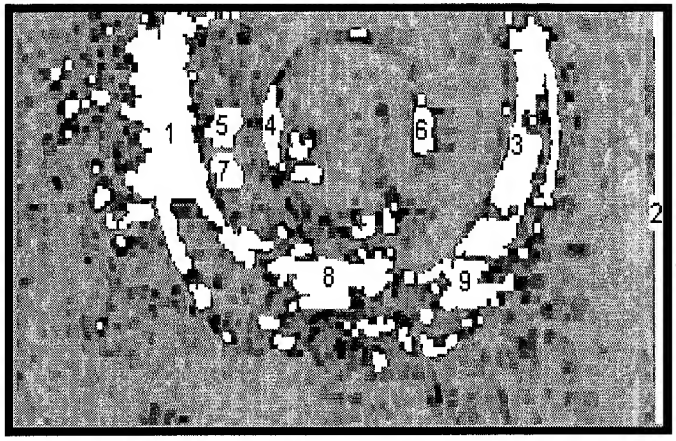


FIGURE 87

File Edit Format Help

Number of row with variable names (blank if none):

First row containing actual training data: 1

left/right arrow keys end edit

Size: 100 rows 20 columns

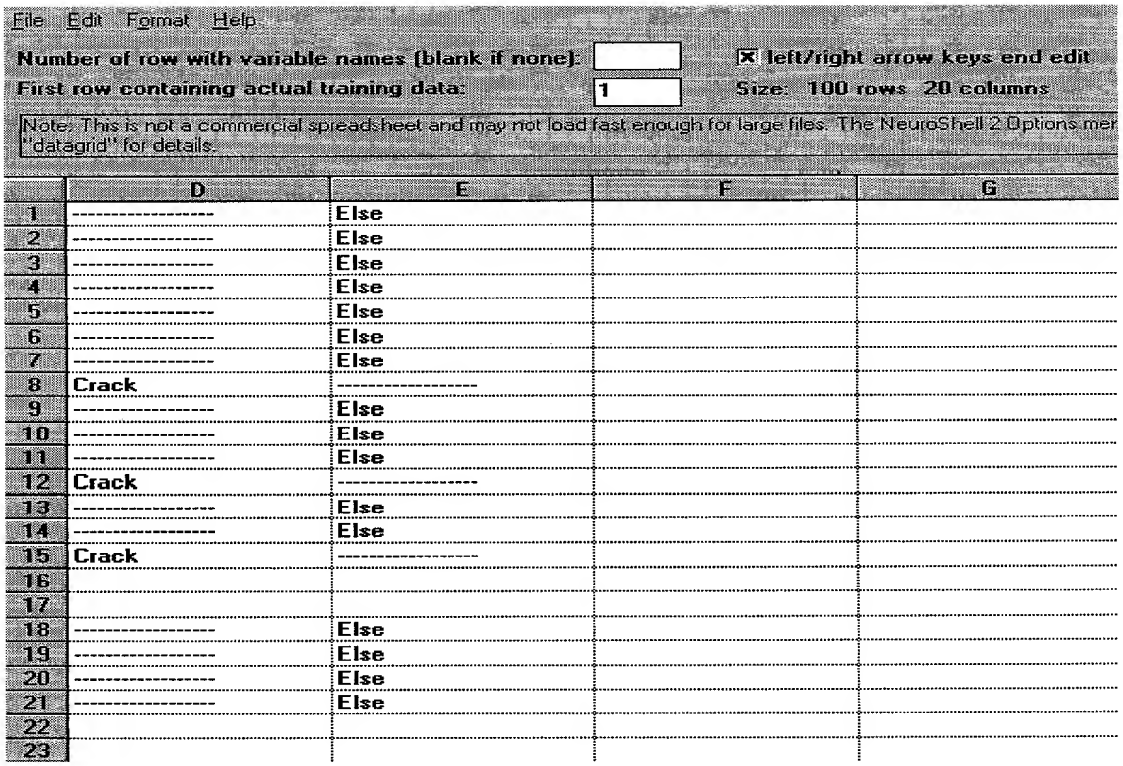
Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options mer "datagrid" for details.

	D	E	F	G
1	----------	Else		
2	----------	Else		
3	----------	Else		
4	----------	Else		
5	----------	Else		
6	----------	Else		
7	----------	Else		
8	Crack	----------		
9	----------	Else		
10	----------	Else		
11	----------	Else		
12	Crack	----------		
13	----------	Else		
14	----------	Else		
15	----------	Else		
16				
17				
18	----------	Else		
19	----------	Else		
20	----------	Else		
21	----------	Else		
22				

FIGURE 88A

	D	E	F	G
23				
24	----------	Else		
25	----------	Else		
26				
27				
28	Crack	----------		
29	----------	Else		
30				
31				
32	----------	Else		
33	Crack	----------		
34	----------	Else		
35	----------	Else		
36	----------	Else		
37	----------	Else		
38	----------	Else		
39	----------	Else		
40	----------	Else		
41				
42				
43				

FIGURE 88B



	D	E	F	G
1	----------	Else		
2	----------	Else		
3	----------	Else		
4	----------	Else		
5	----------	Else		
6	----------	Else		
7	----------	Else		
8	Crack	----------		
9	----------	Else		
10	----------	Else		
11	----------	Else		
12	Crack	----------		
13	----------	Else		
14	----------	Else		
15	Crack	----------		
16				
17				
18	----------	Else		
19	----------	Else		
20	----------	Else		
21	----------	Else		
22				
23				

FIGURE 89A

	D	E	F	G
24	Crack	----------		
25	----------	Else		
26				
27				
28	----------	Else		
29	----------	Else		
30				
31				
32	----------	Else		
33	Crack	----------		
34	----------	Else		
35	----------	Else		
36	----------	Else		
37	----------	Else		
38	----------	Else		
39	----------	Else		
40	----------	Else		
41				
42				

FIGURE 89B

File Edit Format Help

Number of row with variable names (blank if none):

First row containing actual training data: 1

☒ left/right arrow keys end edit

Size: 100 rows 20 columns

Note: This is not a commercial spreadsheet and may not load fast enough for large files. The NeuroShell 2 Options men "datagrid" for details.

	D	E	F	G
1	----------	Else		
2	----------	Else		
3	----------	Else		
4	----------	Else		
5	----------	Else		
6	----------	Else		
7	----------	Else		
8	Crack	----------		
9	----------	Else		
10	----------	Else		
11	----------	Else		
12	Crack	----------		
13	----------	Else		
14	----------	Else		
15	Crack	----------		
16				
17				
18	----------	Else		
19	----------	Else		
20	----------	Else		
21	----------	Else		

FIGURE 90A

	D	E	F	G
22				
23				
24	----------	Else		
25	----------	Else		
26				
27				
28	----------	Else		
29	----------	Else		
30				
31				
32	----------	Else		
33	Crack	----------		
34	----------	Else		
35	----------	Else		
36	----------	Else		
37	----------	Else		
38	----------	Else		
39	----------	Else		
40	----------	Else		
41				
42				

FIGURE 90B

	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1				Else							
2				Else							
3				Else							
4				Else							
5				Else							
6				Else							
7				Else							
8				Crack							
9				Else							
10				Else							
11				Else							
12				Crack							
13				Else							
14				Else							
15		equal								Crack	
16											
17											
18				Else							
19				Else							
20				Else							
21				Else							
22											

FIGURE 91A

	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
23											
24			equal				Else				
25				Else							
26											
27											
28			equal								Else
29				Else							
30											
31											
32				Else							
33				Crack							
34				Else							
35				Else							
36				Else							
37				Else							
38				Else							
39				Else							
40				Else							
41											

FIGURE 91B

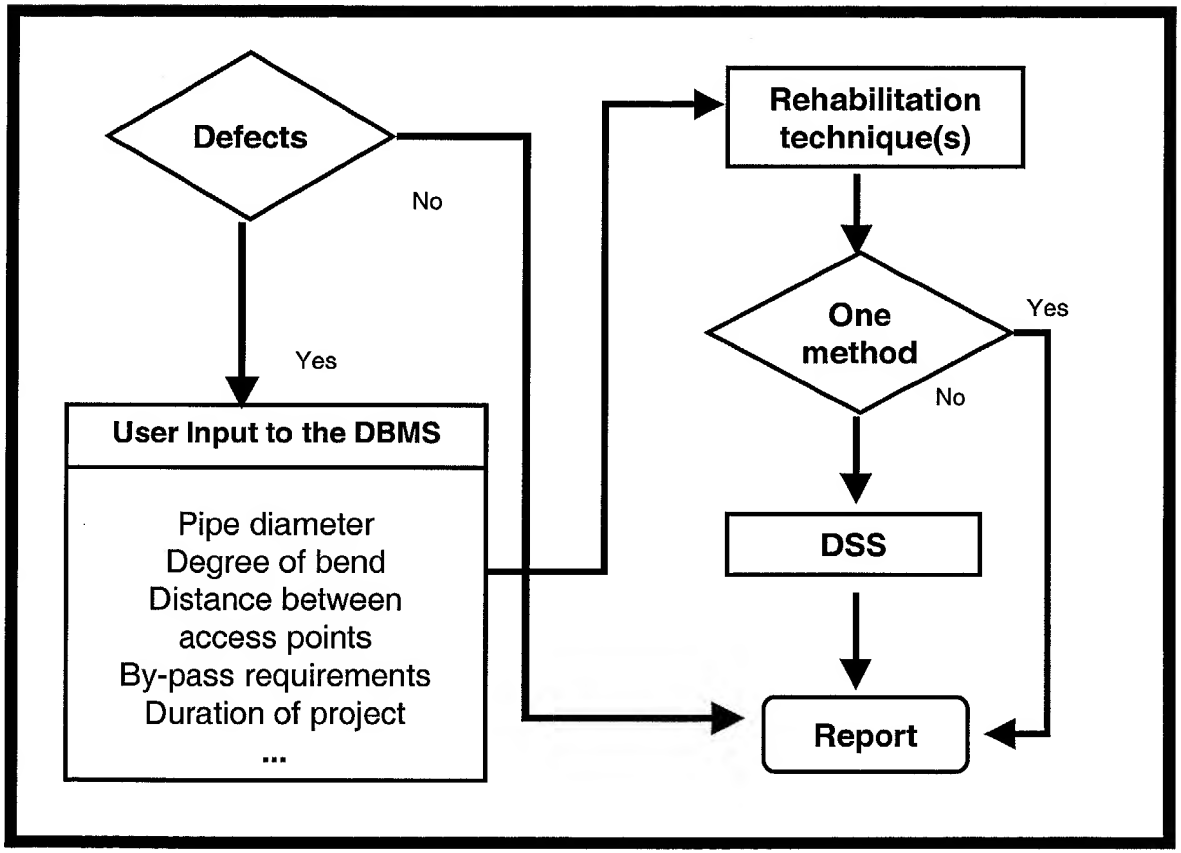

Defects
No
Yes
Rehabilitation technique(s)
One method
Yes
No
User Input to the DBMS
Pipe diameter
Degree of bend
Distance between access points
By-pass requirements
Duration of project
...
DSS
Report

FIGURE 92

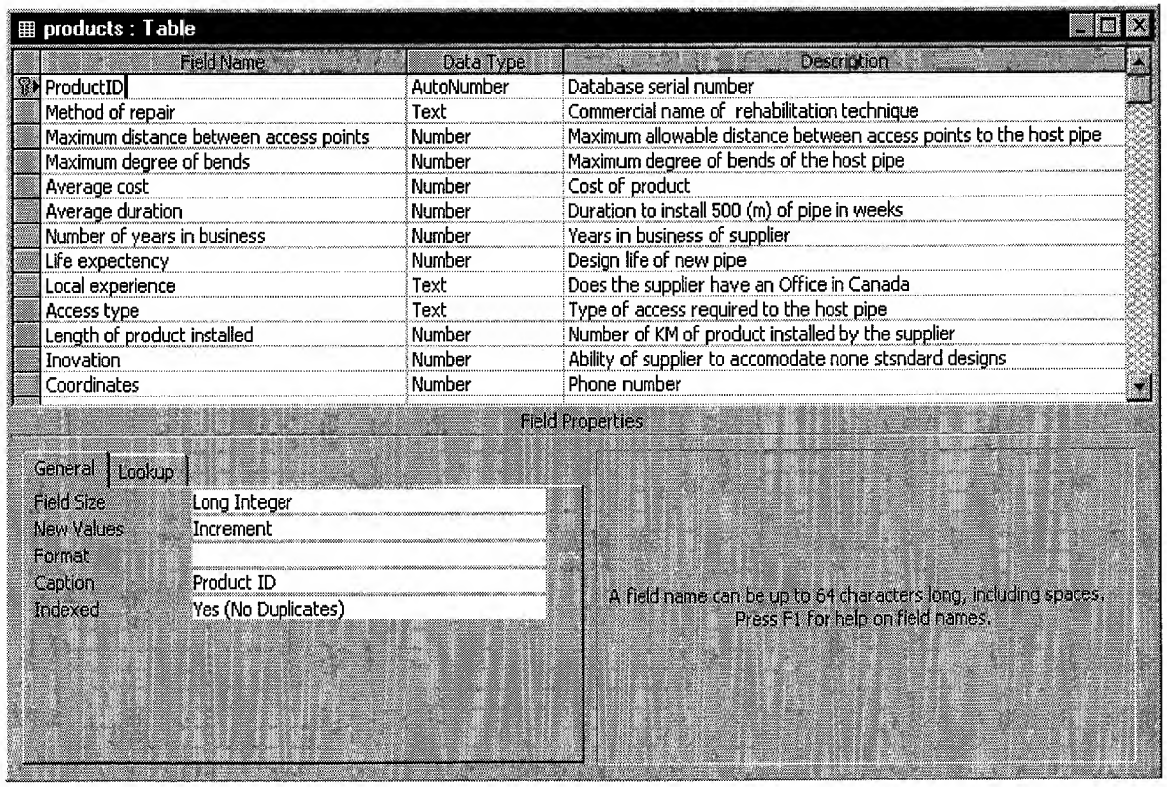

products : Table
Field Name
Data Type
Description
ProductID
AutoNumber
Database serial number
Method of repair
Text
Commercial name of rehabilitation technique
Maximum distance between access points
Number
Maximum allowable distance between access points to the host pipe
Maximum degree of bends
Number
Maximum degree of bends of the host pipe
Average cost
Number
Cost of product
Average duration
Number
Duration to install 500 (m) of pipe in weeks
Number of years in business
Number
Years in business of supplier
Life expectency
Number
Design life of new pipe
Local experience
Text
Does the supplier have an Office in Canada
Access type
Text
Type of access required to the host pipe
Length of product installed
Number
Number of KM of product installed by the supplier
Inovation
Number
Ability of supplier to accomodate none stsndard designs
Coordinates
Number
Phone number
Field Properties
General
Lookup
Field Size
Long Integer
New Values
Increment
Format
Caption
Product ID
Indexed
Yes (No Duplicates)
A field name can be up to 64 characters long, including spaces.
Press F1 for help on field names.

FIGURE 93

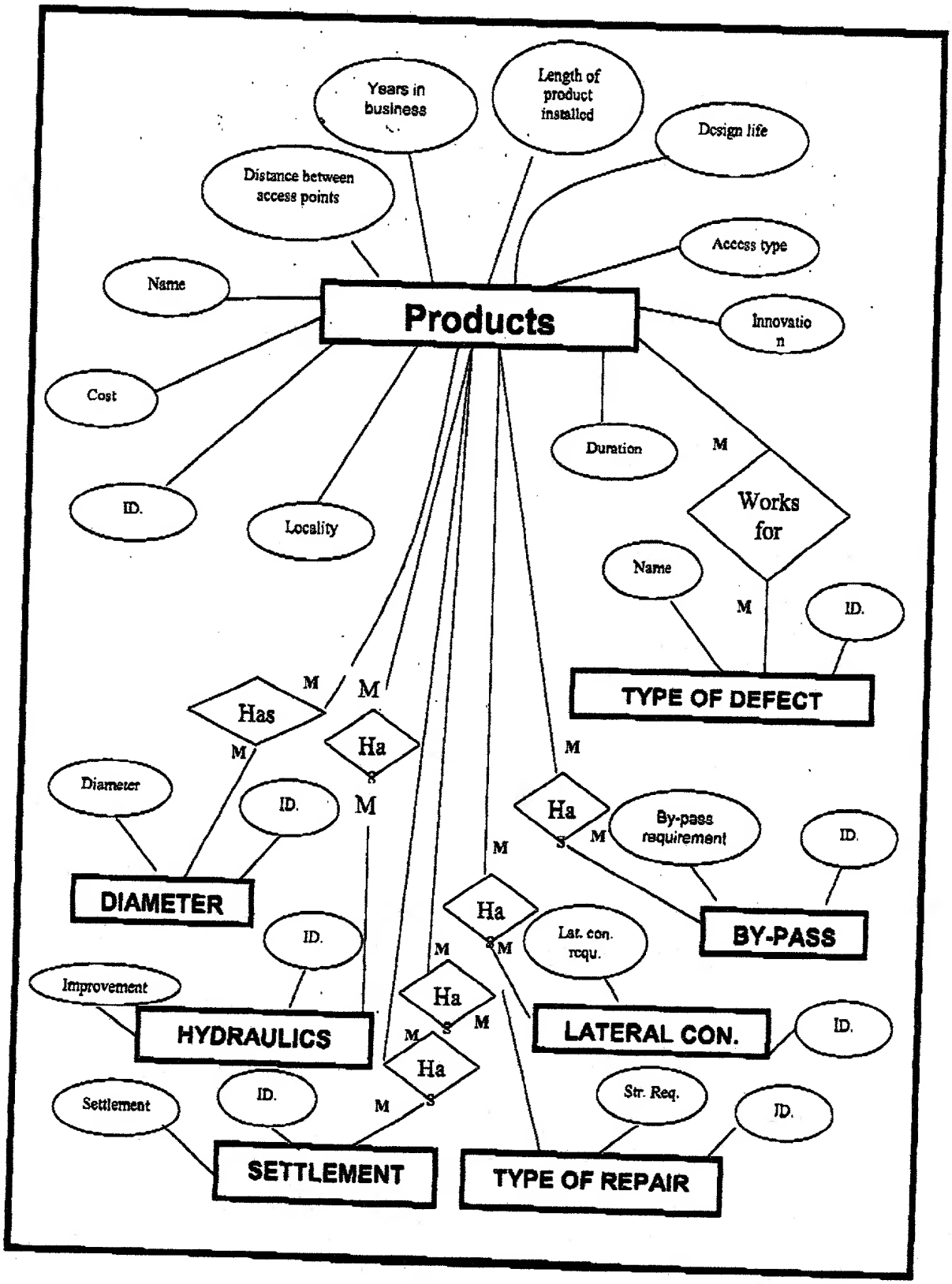

Years in business
Length of product installed
Design life
Distance between access points
Access type
Name
Products
Innovation
Cost
Duration
M
ID.
Locality
Works for
Name
M
ID.
TYPE OF DEFECT
Has
M
M
M
Ha
S
M
Diameter
ID.
M
M
Ha
S
M
By-pass requirement
ID.
DIAMETER
BY-PASS
ID.
Ha
S
M
Lat. con. requ.
Improvement
M
Ha
S
M
HYDRAULICS
LATERAL CON.
ID.
M
Ha
S
Settlement
ID.
M
Str. Req.
ID.
SETTLEMENT
TYPE OF REPAIR

FIGURE 94

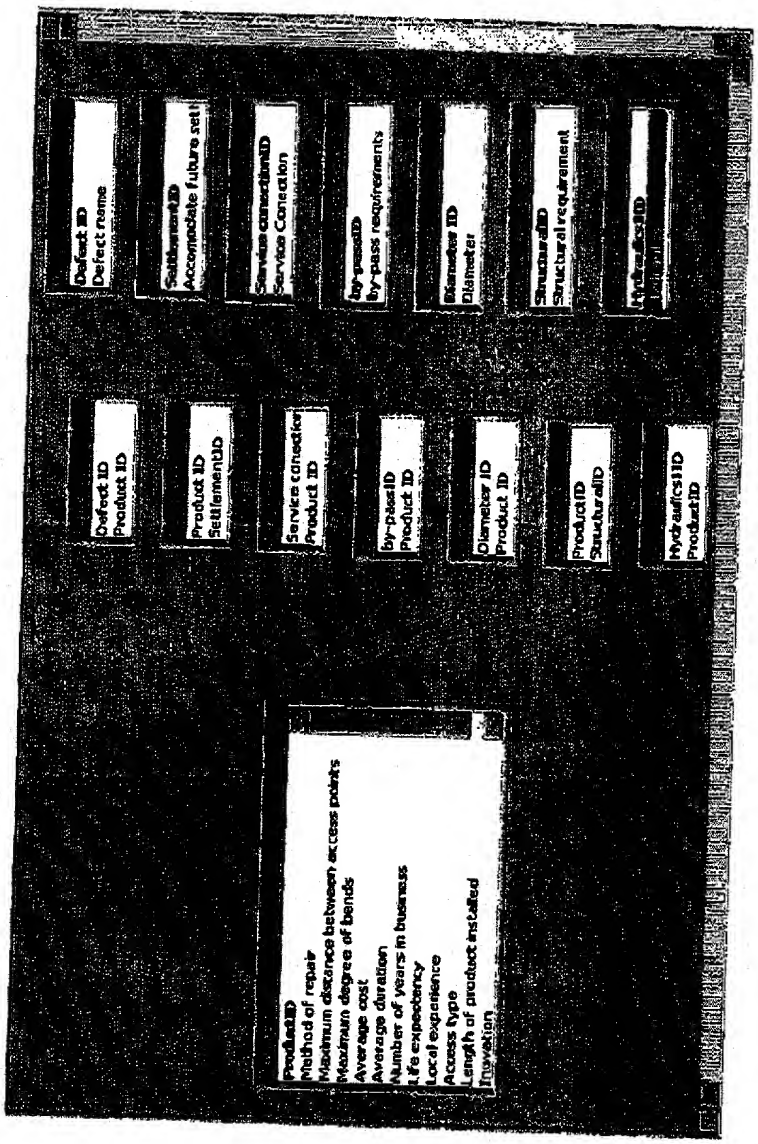

Defect ID
Defect name
SettlementID
Accomodate future set
Service connectionID
Service Conection
by-passID
by-pass requirements
DiameterID
Diameter
StructuralID
Structural requirement
HydraulicsID
Defect ID
Product ID
Product ID
SettlementID
Service connection
Product ID
by-passID
Product ID
DiameterID
Product ID
ProductID
StructuralID
HydraulicsID
ProductID
ProductID
Method of repair
Maximum distance between access points
Maximum degree of bends
Average cost
Average duration
Number of years in business
Life expectancy
Local experience
Access type
Length of product installed
Inovation

FIGURE 95

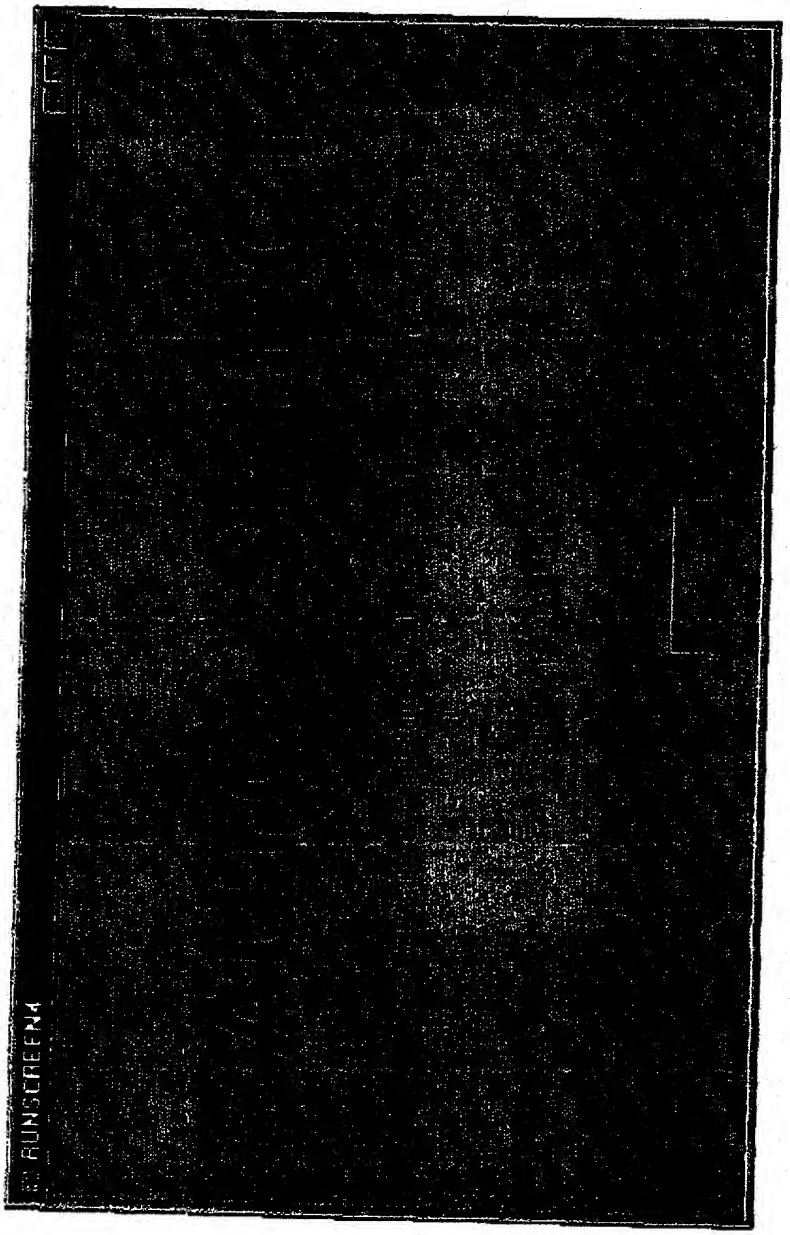


FIGURE 96

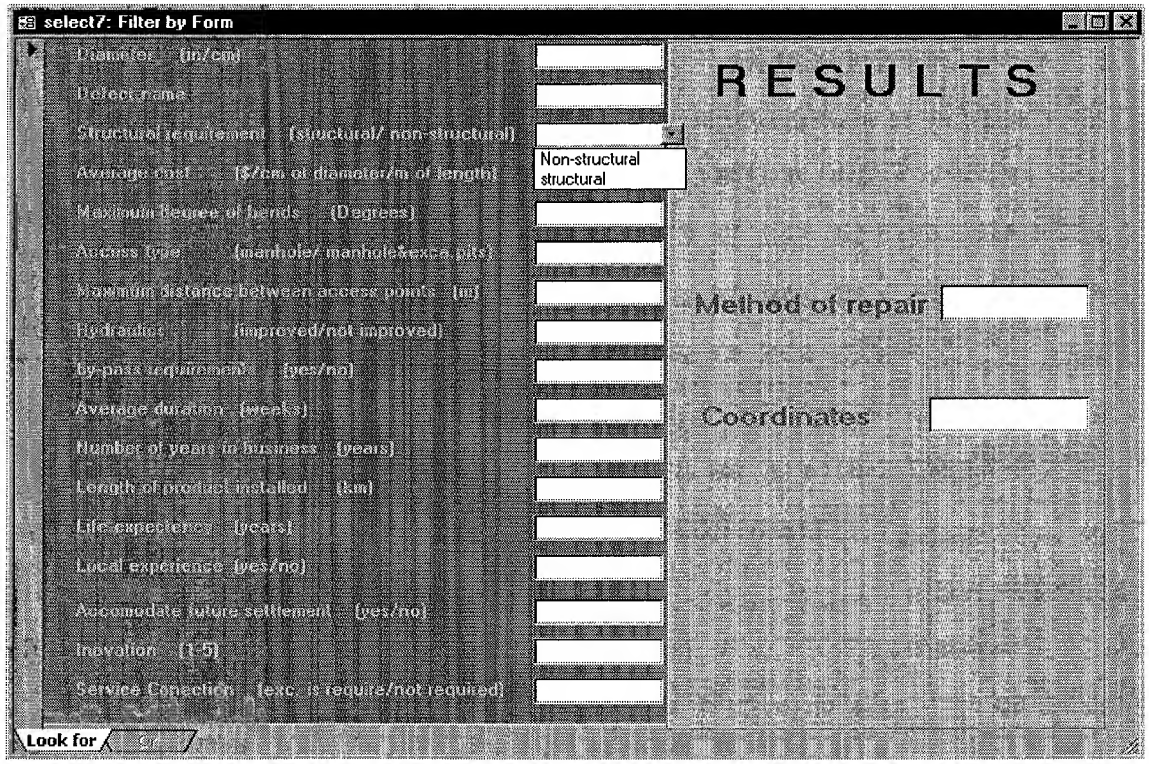

select7: Filter by Form
Diameter (in/cm)
Defect name
Structural requirement (structural/ non-structural)
Non-structural
structural
Average cost (€/cm of diameter/m of length)
Maximum Degree of bends (Degrees)
Access type (manhole/ manhole&exca pits)
Maximum distances between access points (m)
Grade(s) (improved/not improved)
By-pass requirement (yes/no)
Average duration (weeks)
Number of years in business (years)
Length of pipeline installed (km)
Life expectancy (years)
Local experience (yes/no)
Accomodate future settlement (yes/no)
Inovation (1-5)
Service Connection (exc. is require/not required)
RESULTS
Method of repair
Coordinates
Look for

FIGURE 97

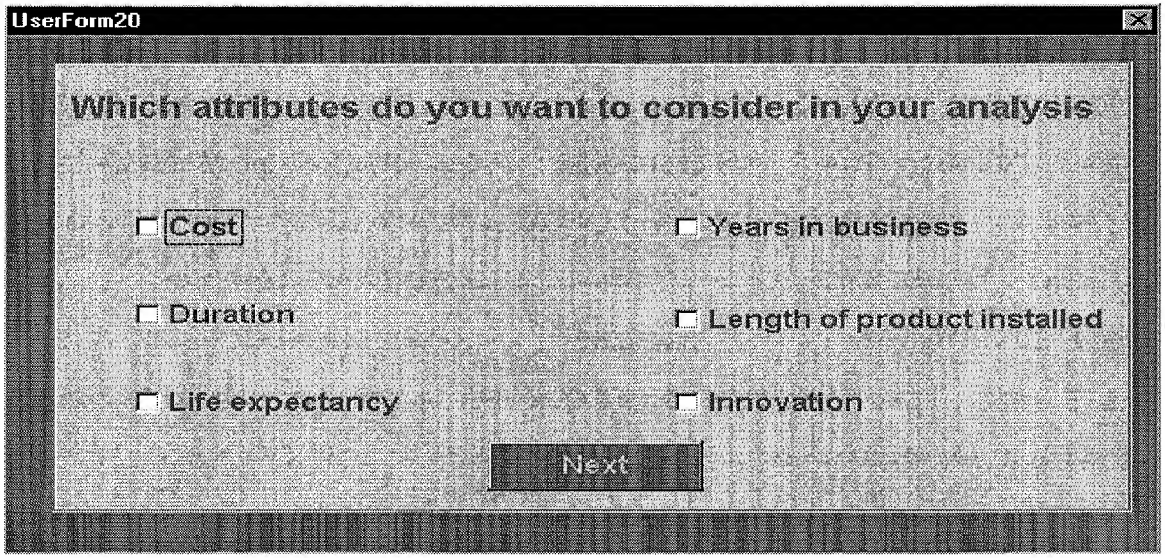

UserForm20
Which attributes do you want to consider in your analysis
Cost
Years in business
Duration
Length of product installed
Life expectancy
Innovation
Next

FIGURE 98

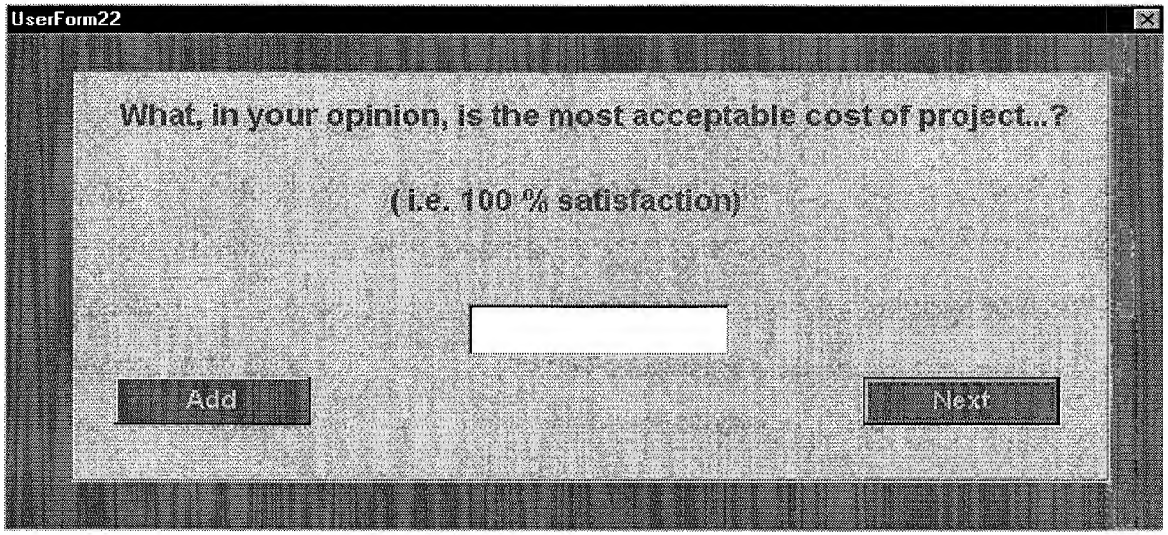

UserForm22
What, in your opinion, is the most acceptable cost of project...?
(i.e. 100 % satisfaction)
Add
Next

FIGURE 99

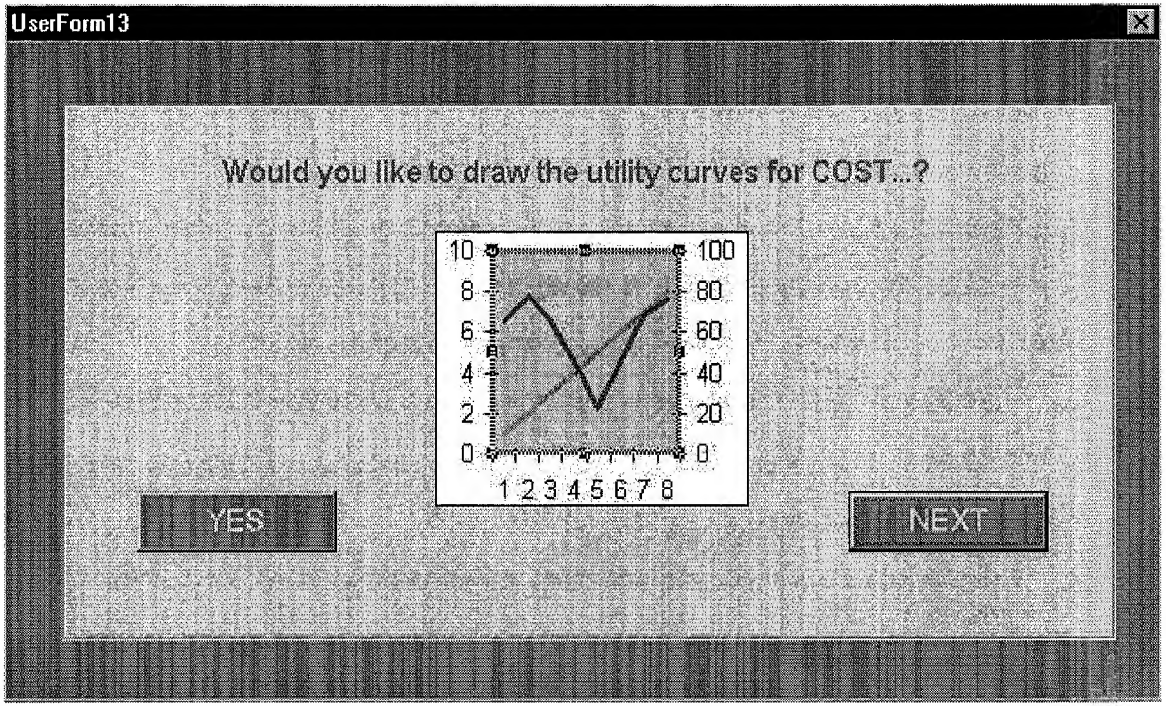

UserForm13
Would you like to draw the utility curves for COST...?
10
8
6
4
2
0
100
80
60
40
20
0
1 2 3 4 5 6 7 8
YES
NEXT

FIGURE 100

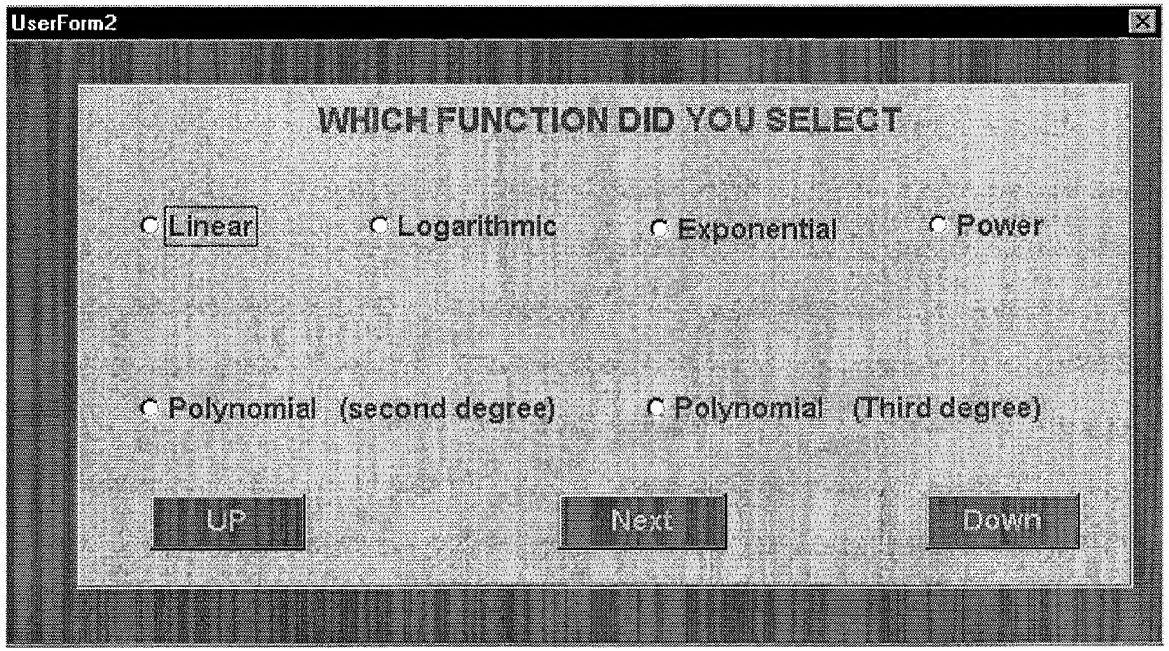

UserForm2
WHICH FUNCTION DID YOU SELECT
Linear
Logarithmic
Exponential
Power
Polynomial (second degree)
Polynomial (Third degree)
UP
Next
Down

FIGURE 101

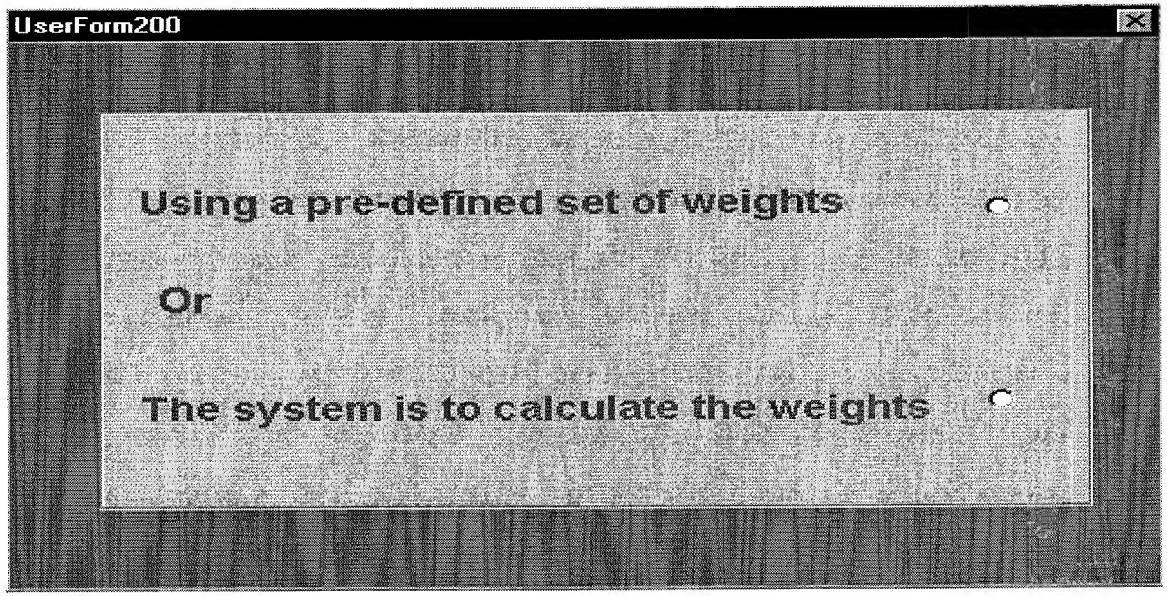

UserForm200
Using a pre-defined set of weights
Or
The system is to calculate the weights

FIGURE 102

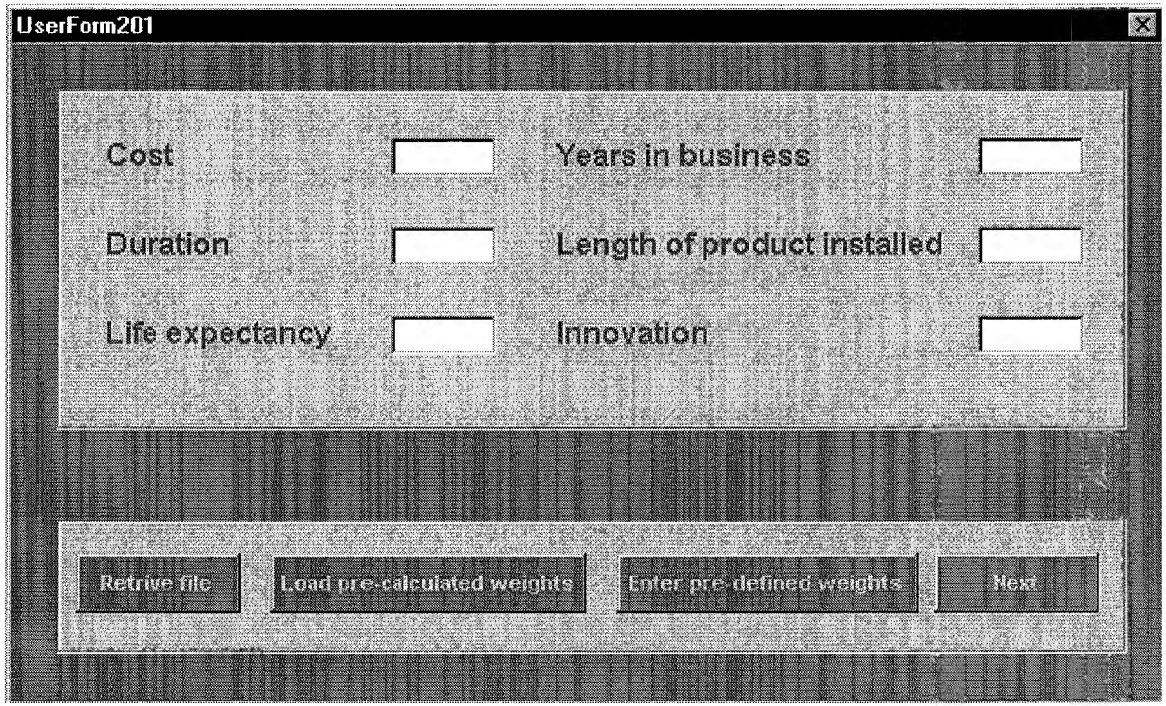

UserForm201
Cost
Years in business
Duration
Length of product installed
Life expectancy
Innovation
Retrive file
Load pre-calculated weights
Enter pre-defined weights
Next

FIGURE 103

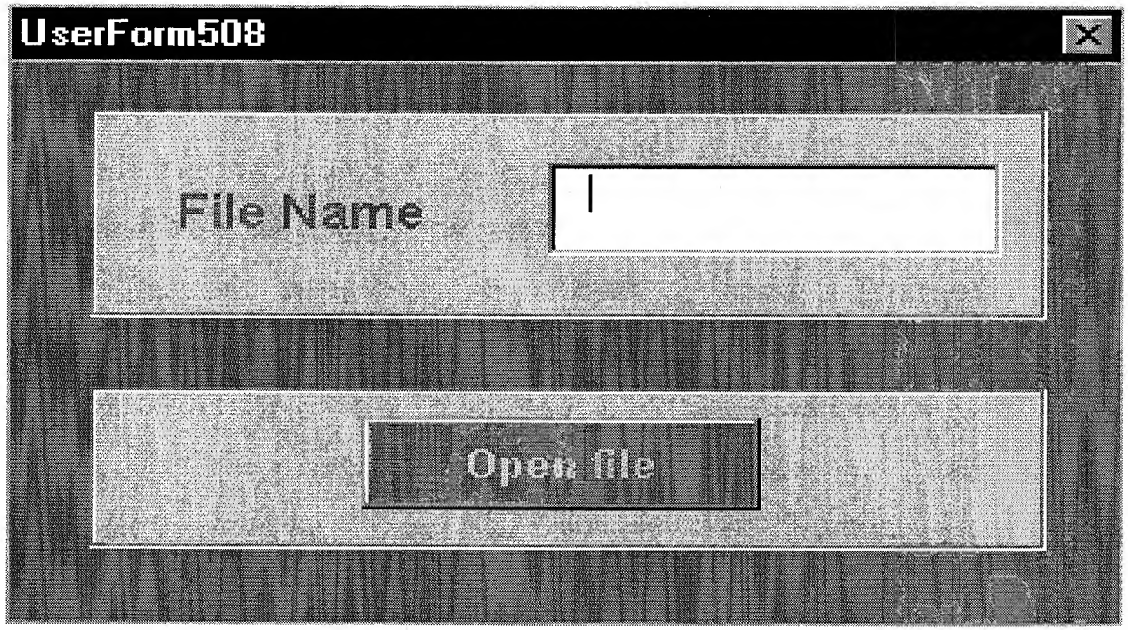


FIGURE 104

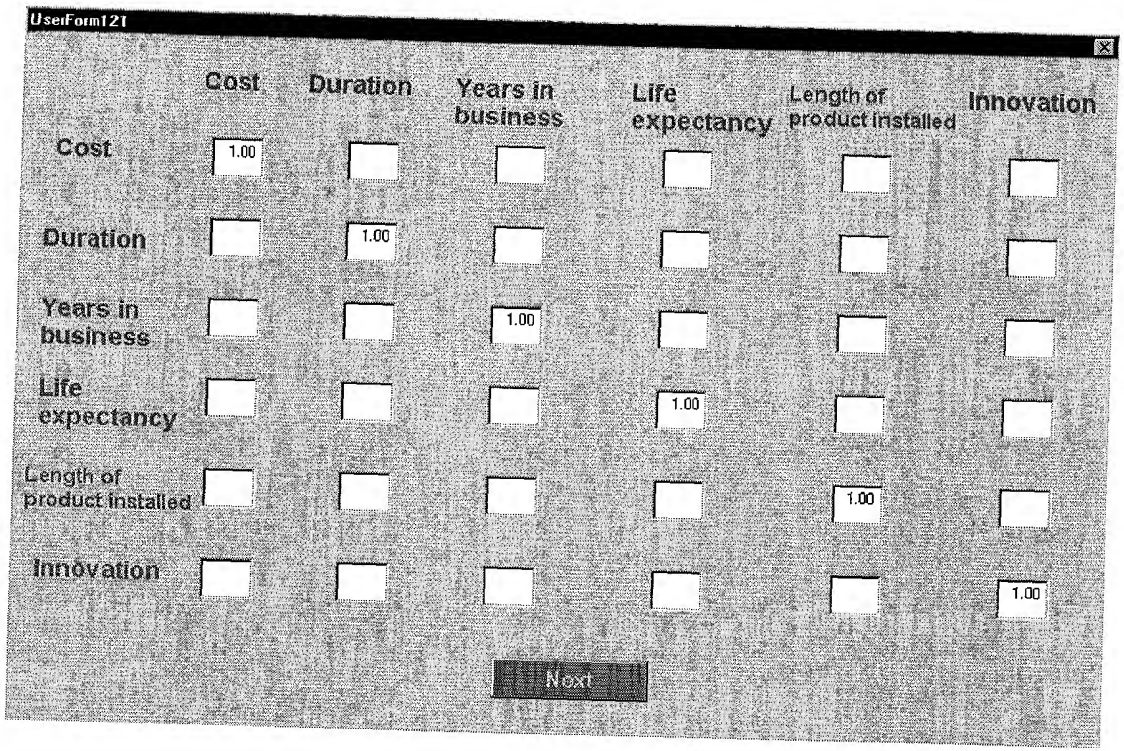

UserForm121
Cost
Duration
Years in business
Life expectancy
Length of product installed
Innovation
Cost
1.00
Duration
1.00
Years in business
1.00
Life expectancy
1.00
Length of product installed
1.00
Innovation
1.00
Next

FIGURE 105

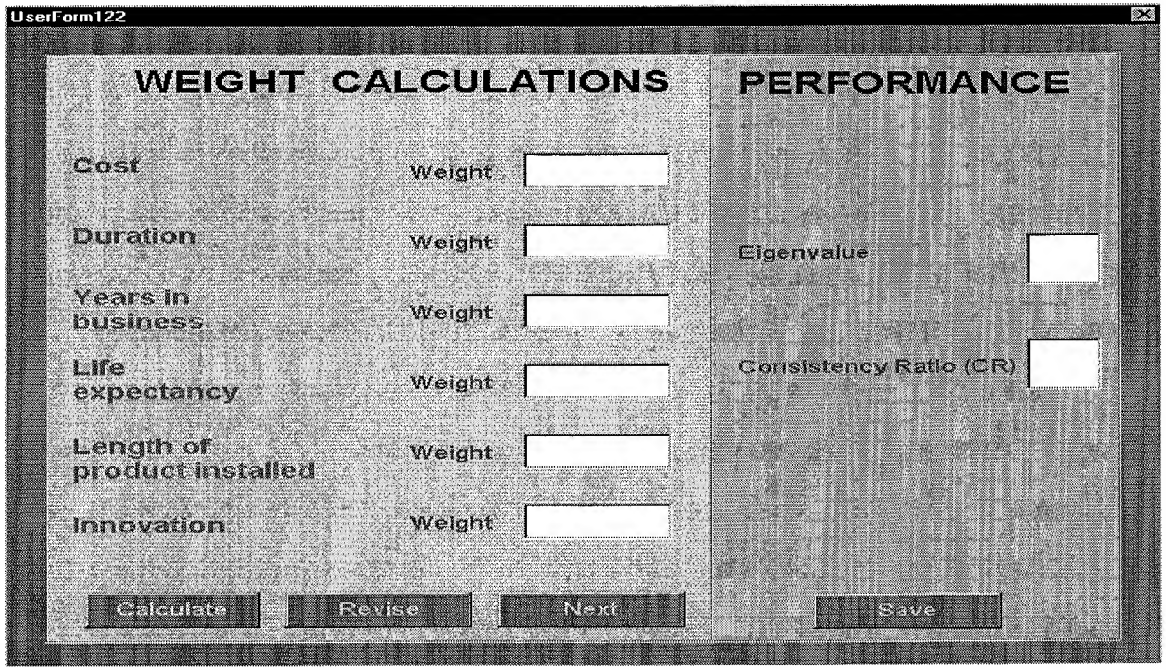

UserForm122
WEIGHT CALCULATIONS
PERFORMANCE
Cost
Weight
Duration
Weight
Years in business
Weight
Life expectancy
Weight
Length of product installed
Weight
Innovation
Weight
Eigenvalue
Consistency Ratio (CR)
Calculate
Revise
Next
Save

FIGURE 106

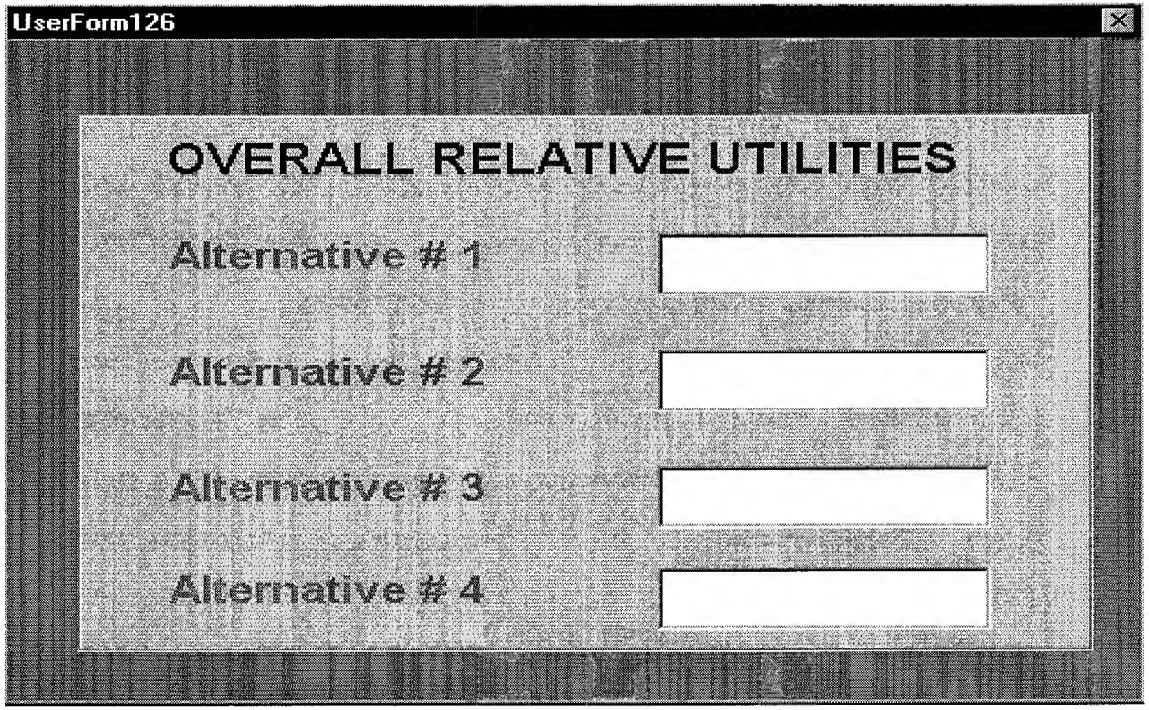

UserForm126
OVERALL RELATIVE UTILITIES
Alternative # 1
Alternative # 2
Alternative # 3
Alternative # 4

FIGURE 107

Attorney Docket No.

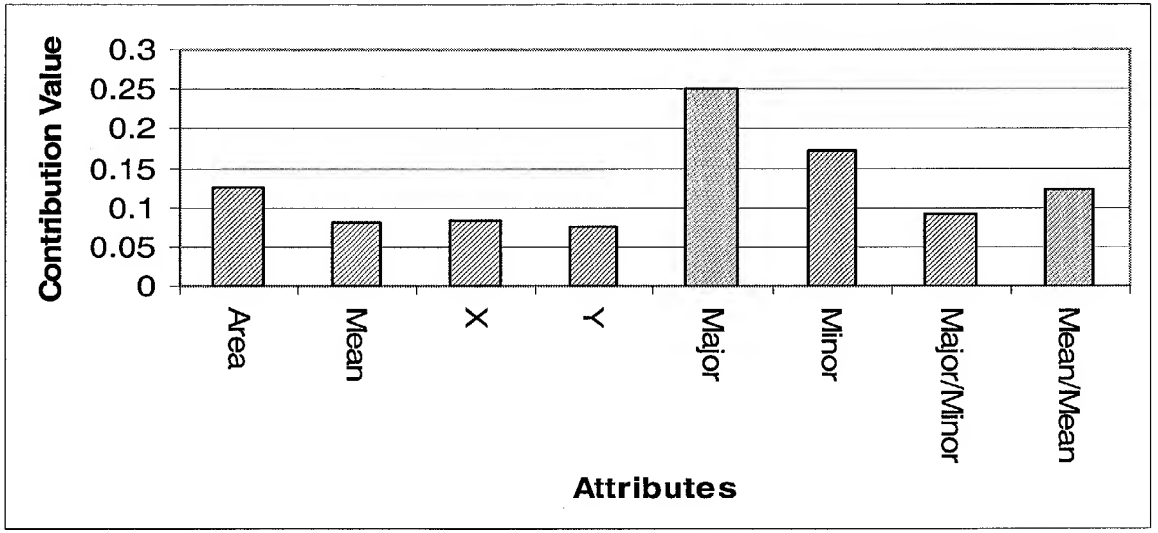


FIGURE 108

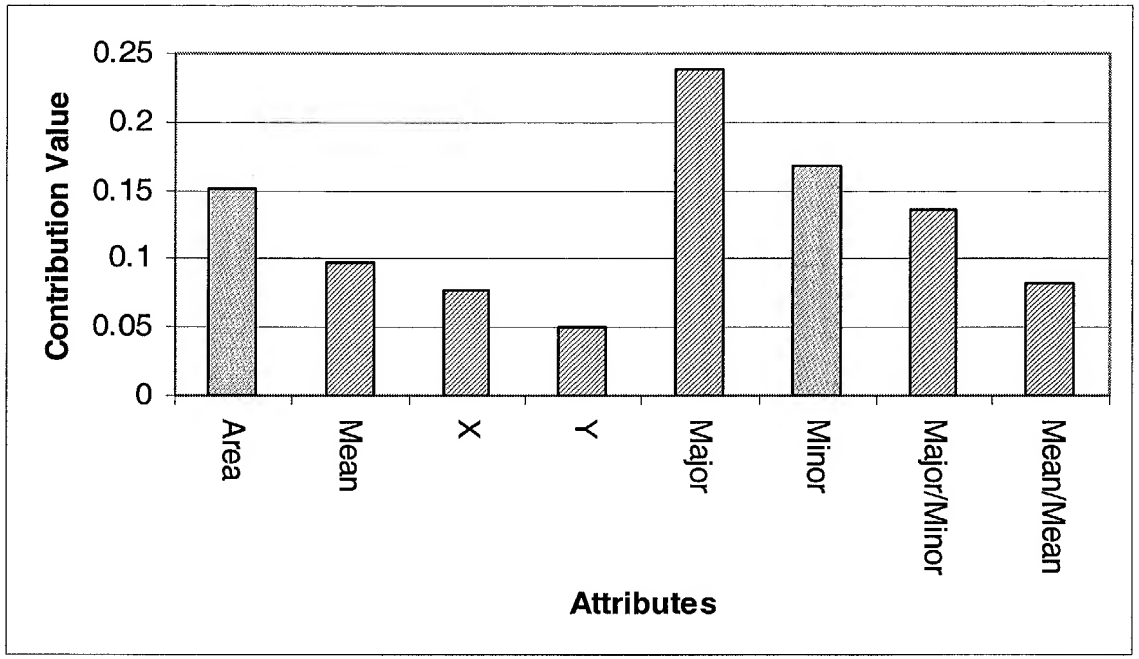

0.25
0.2
0.15
0.1
0.05
0
Contribution Value
Area
Mean
X
Y
Major
Minor
Major/Minor
Mean/Mean
Attributes

FIGURE 109

SUBSTITUTE SHEET (RULE 26)

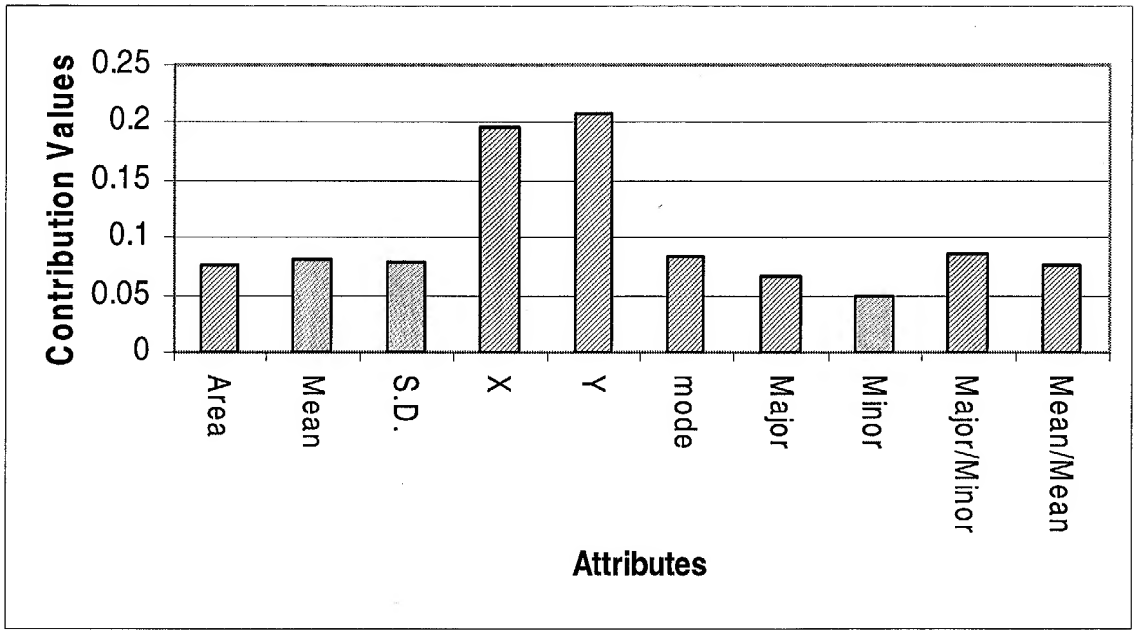


FIGURE 110

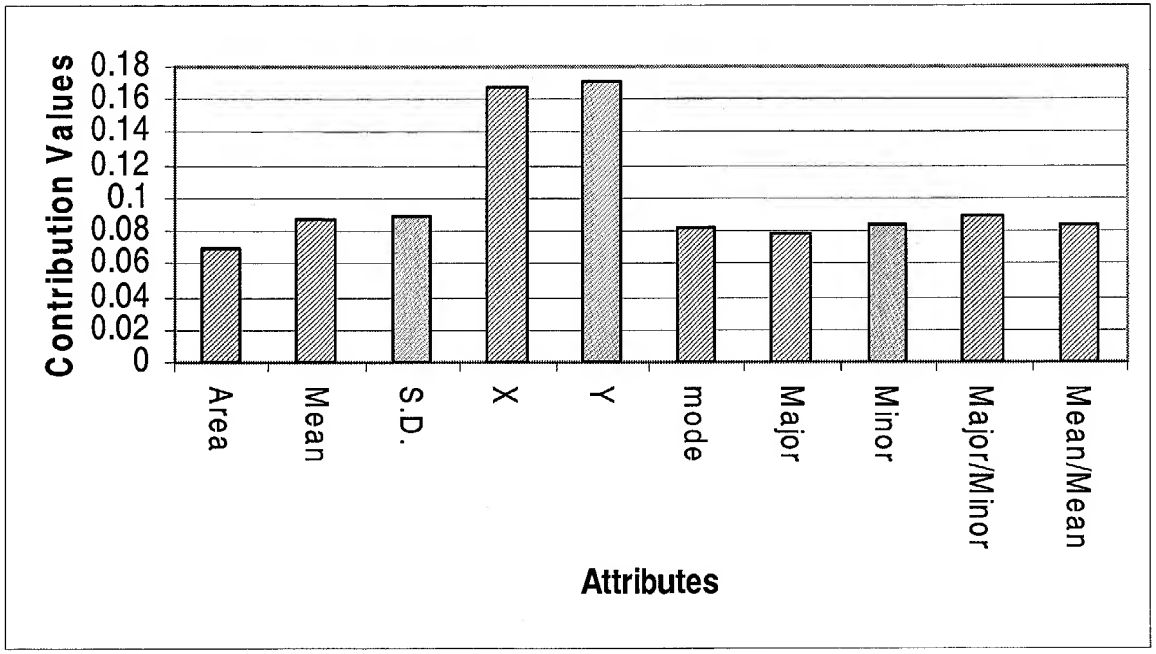

Contribution Values
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
X
Y
mode
Major
Minor
Major/Minor
Mean/Mean
Attributes

FIGURE 111

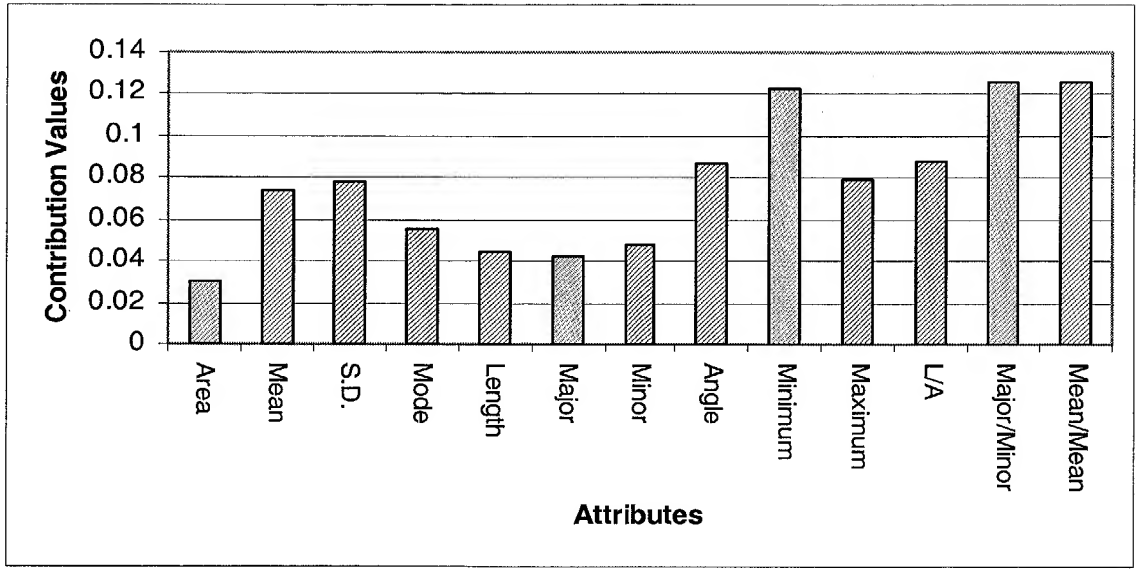

Contribution Values
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
Mode
Length
Major
Minor
Angle
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

FIGURE 112

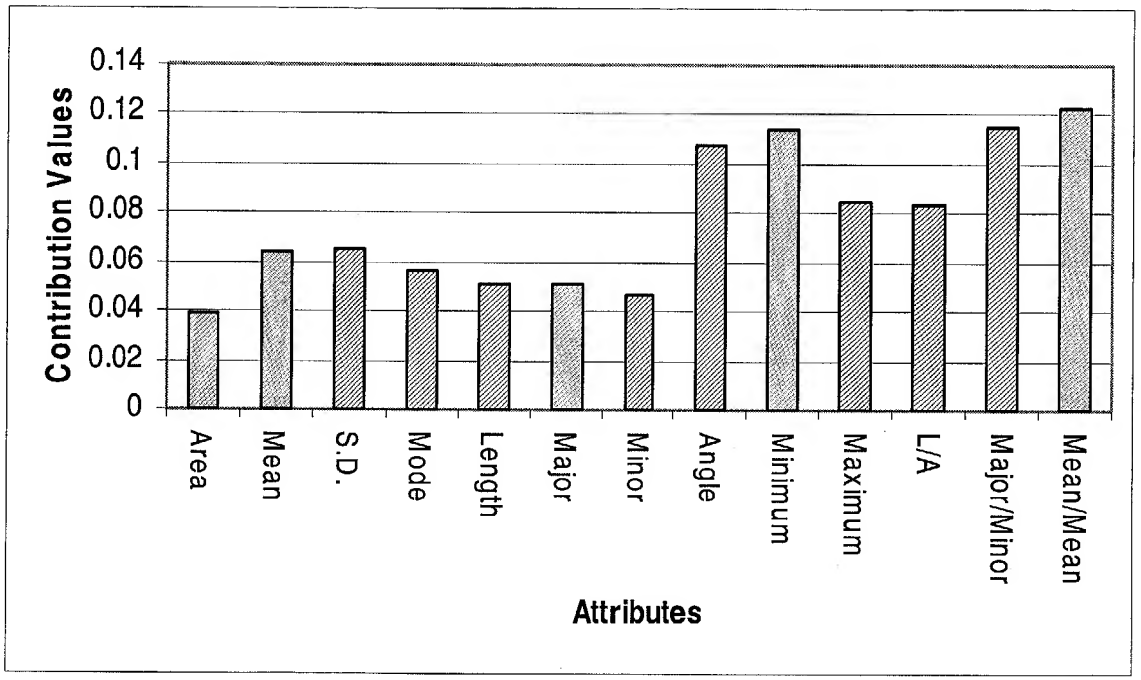

Contribution Values
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
Mode
Length
Major
Minor
Angle
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

FIGURE 113

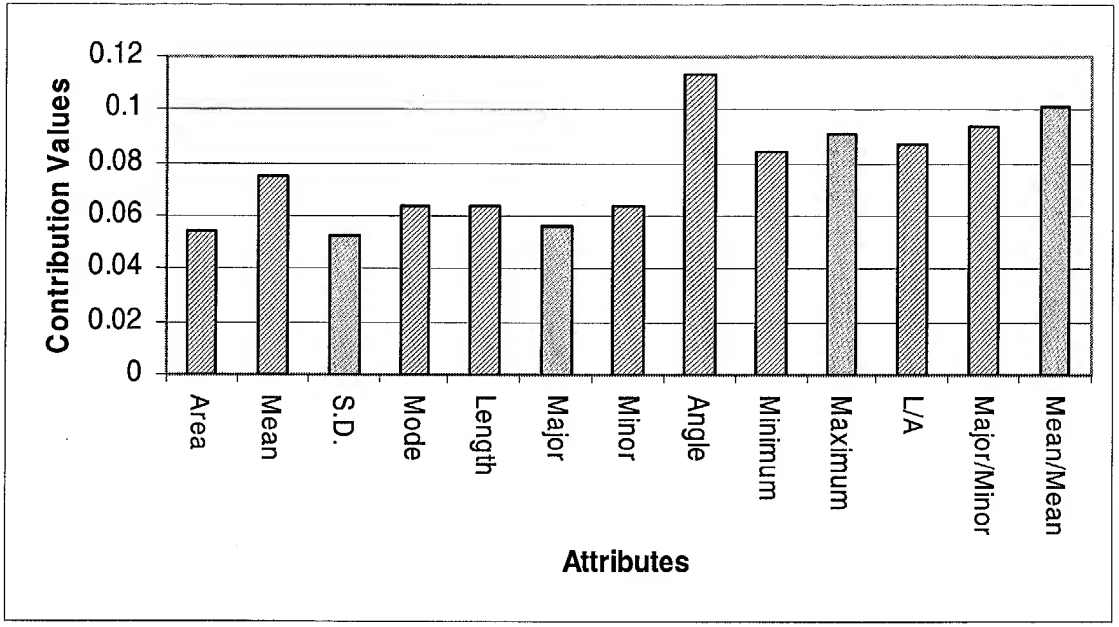

Contribution Values
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
Mode
Length
Major
Minor
Angle
Minimum
Maximum
L/A
Major/Minor
Mean/Mean
Attributes

FIGURE 114

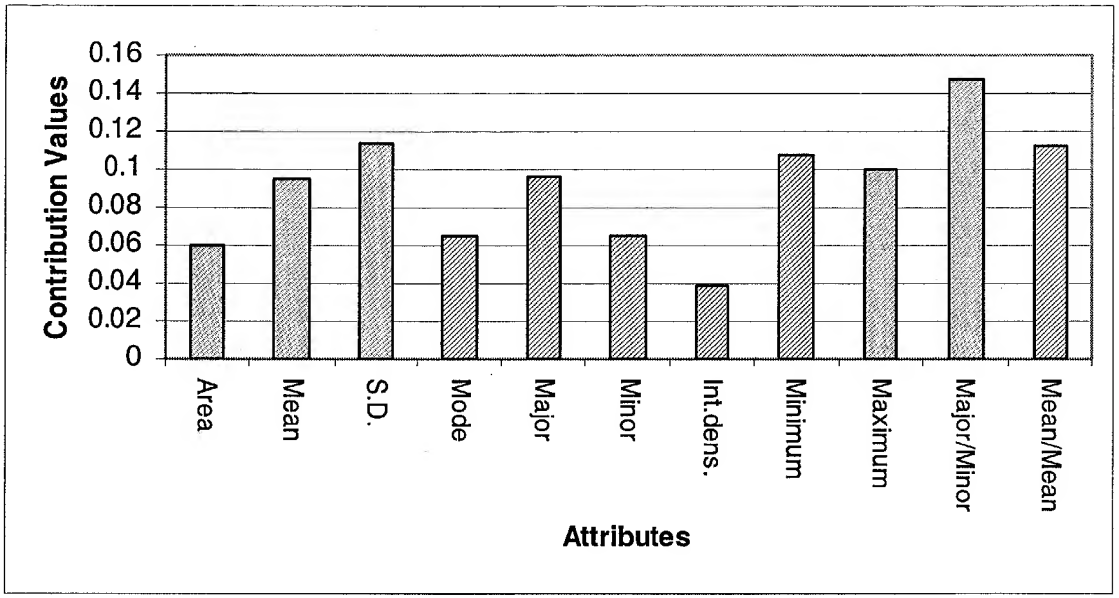

Contribution Values
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Area
Mean
S.D.
Mode
Major
Minor
Int.dens.
Minimum
Maximum
Major/Minor
Mean/Mean
Attributes

FIGURE 115

SUBSTITUTE SHEET (RULE 26)

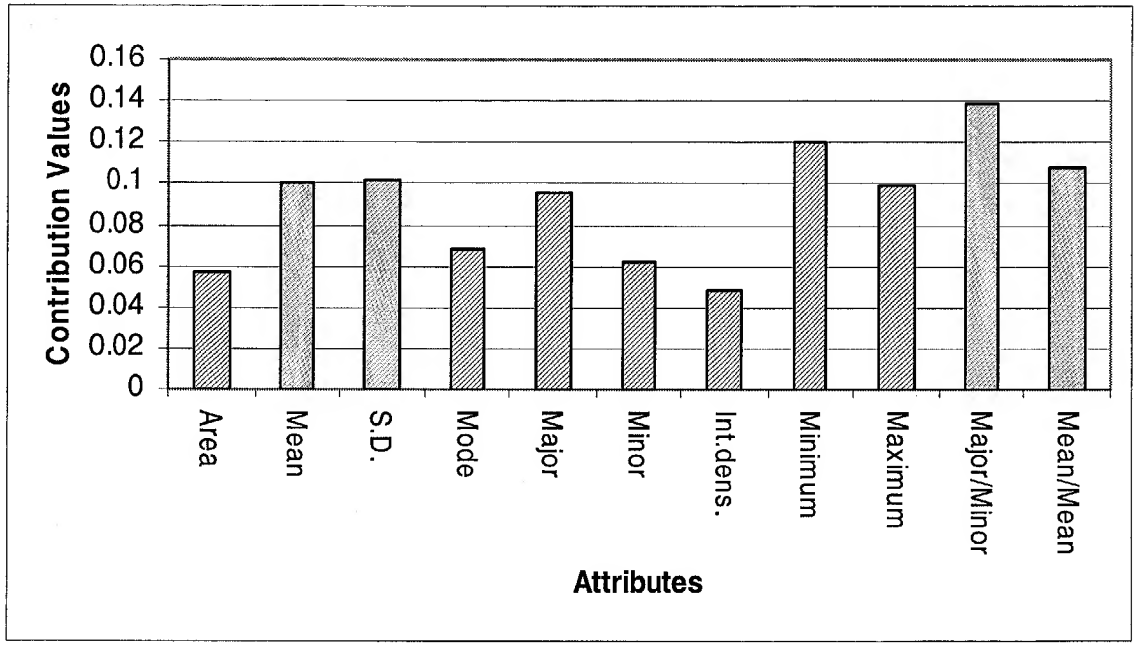


FIGURE 116

Approved Released

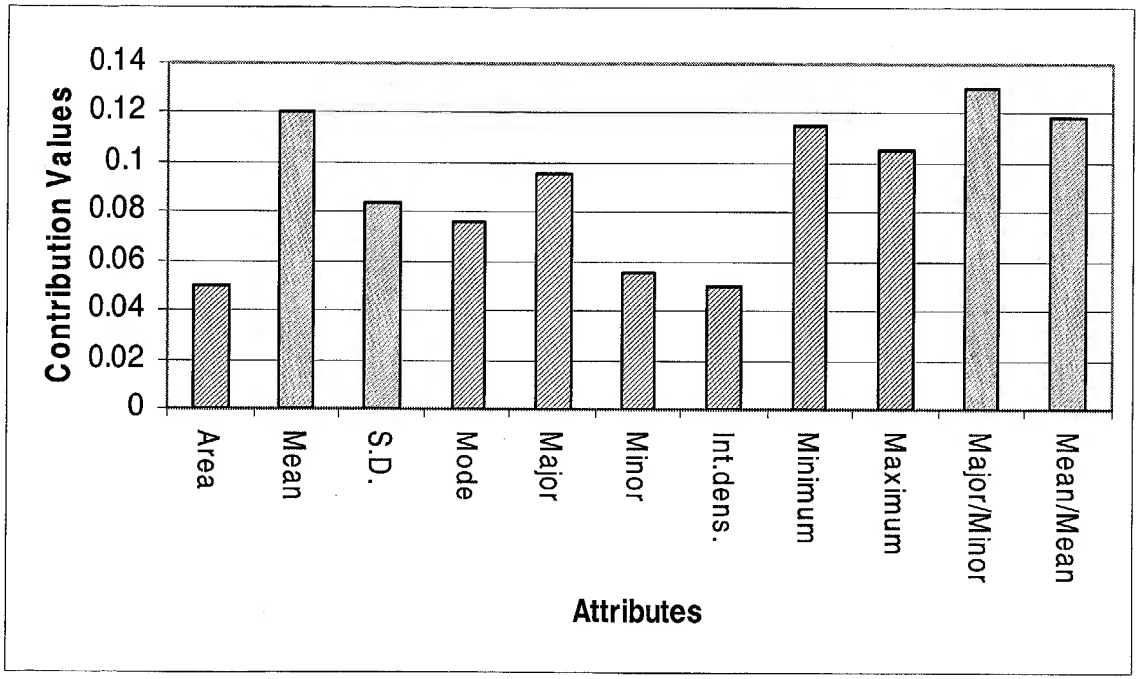


FIGURE 117

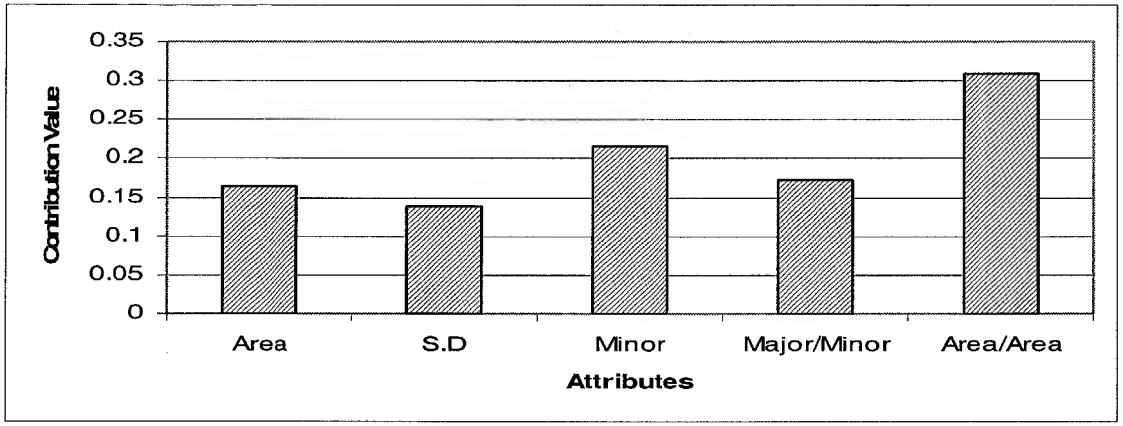

0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Contribution Value
Area
S.D
Minor
Major/Minor
Area/Area
Attributes

FIGURE 118

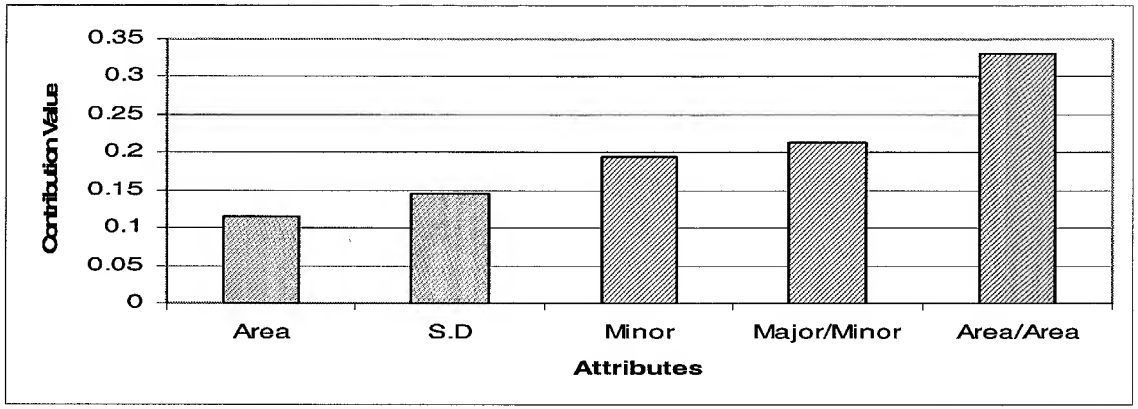

0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Contribution Value
Area
S.D
Minor
Major/Minor
Area/Area
Attributes

FIGURE 119

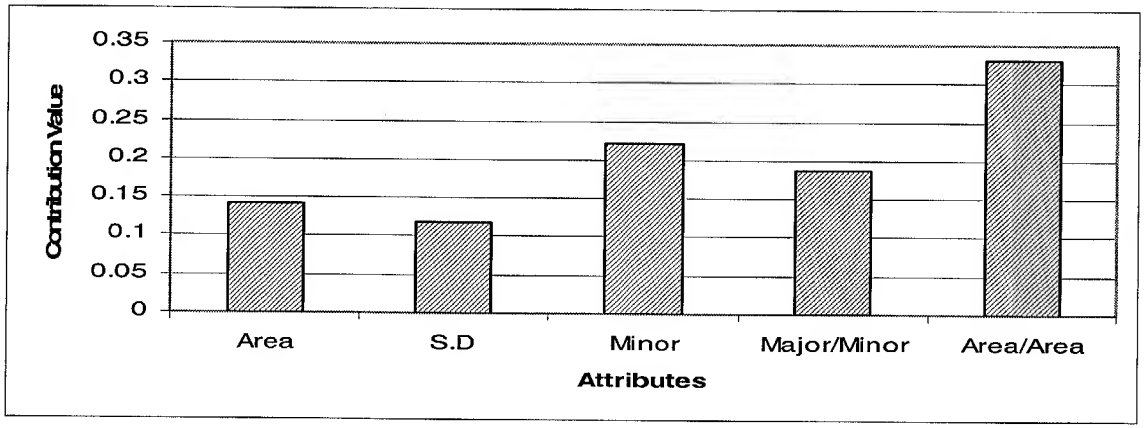

0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Contribution Value
Area
S.D
Minor
Major/Minor
Area/Area
Attributes

FIGURE 120